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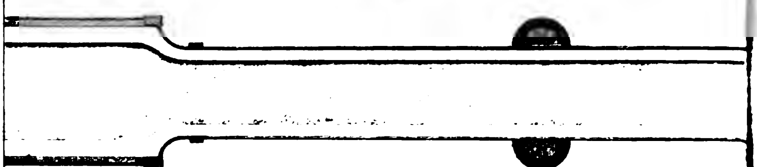
Plan of the Roadway



Drawn on Stone by T. Dighton.

Mr. William [illegible] from [illegible] H. Smith

TRANSACTIONS

OF

THE PLYMOUTH INSTITUTION.

PLYMOUTH,

PRINTED AND PUBLISHED BY ROWE,

AND SOLD BY

BALDWIN AND CRADOCK, LONDON.

1830.

ADVERTISEMENT.

THE Plymouth Institution was founded in 1812, for the promotion of Literature, Science, and the Fine Arts, in the town and neighbourhood.

Among other means adopted in furtherance of the objects of the Institution, it has been deemed expedient in the 18th year of its existence, to publish a volume of essays, selected from the lectures read during the annual sittings of the Society.

But since the publication of their lectures is not obligatory upon the members, by the Society's laws, the present series consists exclusively of such as have been voluntarily tendered by the authors; although it has been found impracticable to include all the papers offered for that purpose, without enlarging the volume to an undesirable extent.

It has been also the object of the Society to confine the present volume as much as possible to those subjects, for the discussion of which, local facilities or other circumstances, give to the *members, advantages not within the reach of their fellow labourers in the field of knowledge. In this point of view, at least, the Society hopes that a volume of its Transactions may not be an unacceptable contribution to the general stock of literary and scientific information.*

It may be necessary to add, that the Society does not hold itself amenable for the opinions or statements advanced in the several essays. That responsibility rests with the respective authors.

Athenæum, Plymouth,
August, 1830.

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ERRATA.

Page 47,—Note, 5th line from bottom, *for* framed plate, *read* frame and plate.

—— 64,—line 1, *for* necessary consequence of, *read* perfectly consistent with.

—— 77,—line 4 from bottom, *for* $\frac{1}{S_2}$ *read* $\frac{1}{S^2}$

—— 80,—Exper. 25, line 2, — *bd.* —— *ba.*

—— 83,—line 12 from top, — *DE.* —— *De.*

—— 96,—for *Attractive force*, read every where *Attractive force of the free action*.

—— 295, line 6, *for* Gen.—EAGLES, *insert* Subg.—Eagles.

—— 324, — 23, — Subg.—(Spoonbills.)—— Gen.—SPOONBILLS.

—— 340, — 20, — October, 1822, —— November, 1802.

Note—Mr. Prideaux's paper having been printed two years, and written more than three, contains many geological terms which have gradually become obsolete; but as they are still understood, it has not been thought necessary to particularize them.

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TRANSACTIONS.

A DISCOURSE, DELIVERED AT THE OPENING OF THE PLYMOUTH ATHENÆUM, FEBRUARY 4TH, 1819, BY ROBERT LAMPEN, M. A. MEMBER OF THE SOCIETY.

Omnes in universum monitos volumus, ut scientiæ veros fines cogitent; nec eam aut animi causa petant, aut ad contentionem, aut ut alios despiciant, aut ad commodum, aut ad famam, aut ad potentiam, aut hujusmodi inferiora, sed ad meritum et usus vitæ, eamque in Charitate perficiant et regant.
BACON.

THE occasion on which we now meet, is most interesting to all who have watched the progress of the Plymouth Institution with a friendly solicitude. It is impossible to take possession of this Athenæum, the result of your perseverance, and the public memorial of your zeal, without feeling satisfied, that the classical elegance of this edifice will not be suffered to remain an evidence of hopes, rather than of attainments; but that every exertion will be used to secure all that it seems to promise. For, without any extravagant estimate of the past, you may cherish the remembrance of your efforts hitherto, however unpretending, as contributions towards the local facilities of improvement; and you cannot but look with confidence to the stronger claims to support, which a continuance of such exertions must enable your Society to prefer. It may be your praise to have given stability to an Institution uniting social with intellectual enjoyment, and affording motives to exertion, and means of acquiring knowledge, which seldom stimulate and assist the labours of the solitary student.—Neither could I be accused of unjustifiable partiality, if I were to assert, that local attachment may be allowed to influence our anticipations. It cannot be unworthy our zeal to promote the intellectual character of a town, distinguished by its national importance, and by the residence of men, estimable in literary accomplishments, and the pursuits of science and the arts. It is however so easy to transgress the limits which separate the reasonable from the visionary, that we cannot be too cautious in our speculations on the future, if we take care not to damp the ardour which is essential to the continuance of energy. Will it be said that I go beyond the bounds of allowable expectation, when I confess, that surrounded as I now am, by many respectable individuals, united by the common desire of improving the best possession of their nature, I foresee much invaluable enjoyment gladdening the privacy of domestic life; much elevation of character bestowed on social intercourse; many innocent resources afforded to diversify the occasional sameness, to relieve the frequent anxieties, and to ennoble the daily pleasures of existence? There are indeed some, who look with less complacency on the progress and effects of mental acquirements; but I have now the satisfaction of addressing those who partake in one feeling of congratulation and encouragement. The very circumstance of our assembling here, proves that we all calculate on the further progress of those powers which have hitherto been progressive; and that we set a proper value on the increase of our intellectual wealth. Without being misled by any visionary hopes, the experienced possibility of improvement must always afford delight to the benevolent friends of mankind.—In thus looking forward to the advancement of society in all rational habits and happiness, we insensibly make the future an object of the most lively interest, for we identify its promises with the most affectionate wishes of our hearts. In our present attempt to cherish and diffuse the love of knowledge, and to inculcate the inestimable worth of its pleasures, it is impossible to forget that our children may reap where we have sown; that what with us is hope, may with them be reality.

But to secure the benefits that may so reasonably be anticipated, it is necessary that we should keep steadily in view, the great end of all knowledge; and endeavour so to employ the means of its attainment, that we may not deceive ourselves in the pursuit. There is something so sublime in Mind, that it is most difficult to lead it, from the contemplation of its own powers, to that great end for which those powers were designed. Its effects, like those of all invisible and mysterious agents, more frequently excite an indolent feeling of admiration, than encourage profitable inquiry into their moral results. How surpassingly wonderful indeed is that sacred gift of heaven;—that inborn excellence of our nature;—continually active in exploring new regions of thought;—dilating as it were the limited period of human life, by ever presenting to us the visions of the past or the future; the inexhaustible treasures of recollection, or of hope. The indications of Mind survive our accidental possessions, and perpetuate the wisdom of ages. They breathe from the ruins of Thebes and Palmyra; and after the desert has for centuries resumed its silence and its solitude, we can still discover that it was once enlivened by the dominion of intellect. The lapse of time indeed only augments the sources of mental enjoyment, while it shows us how fragile are all our other possessions. Man is not allowed to involve in the discomfiture of his expectations, that high privilege and principle of his nature, which like the sun, shines above the reach of storms, and though often partially obscured, is always the source of light and life. What is it that attaches us to the records of history, but the evidences of Mind, which they perpetuate? We look back to the people of ancient fame, and admire the greatness of their actions, because those actions were evident symbols of superior intellect. It is what they thought, that gave life and interest to what they did. In the highest career of their glory, it is not their power or their success which fixes our attention, but that which made their power awful, and their success the result of wisdom, and not of accident. It is the energy of Mind to which we thus pay involuntary homage ;—and our admiration of Athens and of Rome, is only the expression of that general sentiment of exultation—the instinctive confession "that lofty powers lie treasured up in Man."

But these sublime indications of Mind, may from their very grandeur excite an unprofitable veneration. As those, who are not initiated in the secrets of nature, behold the mighty powers of the material world when loosened from their usual restraints ;—astonished at their effects, and yet unconscious, that the very air they breathe, is supported by their unseen agency; so intellectual power may be regarded, as if it were solely the property of superior beings, and without the present conviction that it is the pervading energy of social life. That conviction is however essentially necessary to secure the useful cultivation of our faculties; and I know not that I could choose a more useful subject for the occasion of opening our Athenæum, than that which is thus suggested to our meditation :—We are now under the most auspicious circumstances, renewing our endeavours to extend the love, and facilitate the acquisition of knowledge. We hope to see those endeavours productive of beneficial effects on individual character, and on the intercourse of life. It must therefore be most interesting at the present moment to enquire, how the pursuits of Literature, Science, and the Arts, may be connected with moral improvement; and what means are within our reach to secure a more extensive co-operation of the Intellect and the Will. It is their probable influence on the conduct that can alone enable us to estimate the real value of our endeavours. It is by securing their beneficial influence, that we can alone recommend them to the Author of our being, who gave us reason, not for idle speculation or personal distinction, but for the completion of a more glorious destiny, as the enlightened adorers of his greatness, and the humble imitators of his moral perfections.

There is nothing that more effectually secures the proper direction of our faculties, than a careful consideration of their mutual dependance. Man is endowed with contemplative and active powers, and they must administer to each other, or the harmony of nature is impaired. The energies of the mind must be defined and directed by the scene which calls them forth. Unless speculation and practice are connected as cause and effect, speculation must lose its worth, and practice its possibilities of improvement. The great object of a well regulated education is, at once, to develope these powers and to preserve their natural association. But few indeed are so admirably disciplined, as to escape, altogether, the tyranny of some disproportionate bias.—Either an undue preference for abstruse researches or ideal enjoyments, gives a distaste for the humbler but essential duties of life; or an exclusive zeal to answer the demands of our social existence, fosters a suspicion that theoretical pursuits are deficient in utility. The few, who cultivate their contemplative faculties, too often become unable to bring them sufficiently within the sphere of social obligations; and the many, who are necessarily led to the details of active life, not unfrequently regard employments of an abstracted character, as something foreign to the real advantage of mankind. Even if the judgment be not perverted entirely by these hasty decisions of habit or inclination, it is too frequently so far influenced, as to check the fearless cultivation of every part of our intelligent nature, and to induce us to impose the shackles of our prejudices on those minds that are entrusted to our direction. Nor can it be at all matter of surprise that the importance of intellectual pursuits should be under-rated, when it is decided by the fallacious test of comparative utility. For the speculative labours of the student do not so challenge observation, as to permit their being fairly estimated; while practical exertions come so home to every man's business and bosom, that they may seem, to superficial notice, to be the only duties of life. The results of scientific experiment or calculation, which facilitate the ordinary business of mankind, bring indeed theory and practice so closely together, that the advantage of speculation, is in these instances unequivocally acknowledged: but even then it is allowed, only, when made evident by such profitable results. The philosopher in his laboratory, and the mathematician in his study are not known as the friends of society, until society has felt their value by some new addition to the sources of wealth or comfort. Thus the advantages of speculation are only confessed on a retrospect, when its manifest effects have placed it in too strong a light to allow the possibility of neglect. The student is alone encouraged by his solitary anticipations;—he must long be considered by many, as amongst the doubtful benefactors of mankind.

The conduct of those who attach themselves exclusively to what are called the Useful Arts, frequently gives an indirect sanction to this depreciation of studious habits. Those who confine themselves to demonstrative or experimental science, are too apt to undervalue whatever cannot be submitted to the rigid test of actual examination, and to discredit the share which the imaginative and moral faculties have in influencing the welfare of the world. The Poet, the Artist, and the lover of elegant Literature, are sometimes found equally forgetful of the obligations they owe to Science. The unthinking are always ready to adopt these prepossessions of superior minds; but the zeal of party soon subsides with them into a kind of general scepticism, and their want of knowledge conspires with their indifference, to persuade them that they have but little interest in these contentions of opinion. Thus the cultivation of the mind, beyond what is actually required for the ordinary occupations of life, is considered frequently as distracting attention, and repairing the mischief with but small returns of practical utility. From these contracted views, the seeds of wisdom, that might most advantageously have been developed, are often carried by their unconscious possessors to the grave; and the entrusted talent is returned unimproved. By the technical mode of education, which such notions recommend, mankind are, as it were, divided into castes, and those prejudices and peculiarities are perpetuated, which are not essential to practical skill, and cannot fail to become obstacles to the free use of the understanding. On the other hand, the abstraction from the business of life, and devotion to theoretical reasoning, which so often characterise the student, and the exclusive admiration, which not unfrequently is confined to his favourite pursuit, lessens the certainty of his knowledge by contracting that field of observation, from which all his conclusions must be derived. Thus either by distrust or by an illiberal partiality, the education which nature suggests and commences in us, is frequently over-ruled, and the faculties are submitted to the restraint of unwise prejudice.

The great restorer of rational philosophy, has taught us, that if we would approach perfection, we must in the devlopement of the moral character, imitate nature, who in her productions throws out, at once, the rudiments of all the parts; and does not, like the Statuary, while finishing the features leave the rest of the marble a shapeless mass.* This precept applies to the method in which the mind should be cultivated, to produce its proper effect on the happiness and conduct of mankind. To suppose that all would thus be brought to an intellectual equality, would be to attribute too much to human controul. The great lines of distinction are marked by nature; and we may surely, without any fear of disturbing the harmony which Supreme Wisdom has established, venture to do all for our endowments that we are enabled to do. We are not called on to forget that division of duties, which social necessities assign us. We are only thus taught to bring to our specific

* De Augmentis Scientiarum. Lib. 7. Cap 3.

employments, the intelligence of an enlightened and liberal mind. To throw on the distinct object of our pursuit, not a few selected rays, but all those blended streams of light, which we are enabled there to concentrate; that we may learn its various relations, and not set on it such an exaggerated value, as would withdraw us entirely from objects of still higher interest; or induce us to look down on the other engagements of mankind, without bestowing our sympathy and encouragement.—It is only under such circumstances, that the beneficial results of cultivating the mind can be fully experienced. We might as justly hope to learn completely, the effects of the senses from one who is blind or deaf, as to see all the moral advantages of a cultivated mind, exemplified under the tyranny of a partial and prejudiced education.

A mind exactly disciplined according to the suggestions of nature, and not cramped in the developement of its powers, would be in little danger of mistaking their importance or their object. The higher principles of conduct would not be undervalued, by faculties so wisely adjusted; and whatever may be the moral influence of intellectual pursuits, it would operate without any obstruction from a jealous rivalry or an illiberal neglect. The contemplation of this perfect harmony of mind, and of its happy consequences on society, has led some theoretical reasoners to imagine extraordinary results from the dissemination of knowledge; and to regard the progress of Science, and Arts, and Letters, as the visible gradation by which we are advancing towards a moral perfection. Such views are certainly attractive from the aspect in which they seem to place mankind, and the poetry which they throw around our present existence; but it must also be confessed, that they have too little foundation to satisfy any one, who has been accustomed to consider the strength and the weakness of his nature. How shall we forget the lessons of ages? How can we reconcile to such a theory the lamentable inconsistencies which the history of man presents? Alas! Science and Art have left mighty records of their past greatness. The triumphs of ancient Genius still survive in the temple and the statue, and the distance of centuries, and the ravages of time, have only served to consecrate them to the veneration of remote posterity. But where are the evidences of moral greatness which we may trace to the influence of this intellectual supremacy? Can we venture to assert, that he who raised the Obelisk and the Pyramid, could claim equal superiority in moral greatness, over the unlettered Arab,—the dull inheritor of the desert? The rites of Isis and Osiris, were long regarded even at Rome with abhorrence; and the city which willingly received the shrines of idolatry from all parts of the vanquished world, refused to admit within its walls the impurities of Egypt, until Rome also flourished in arts, and became feeble in morals. The vestiges of Grecian magnificence afford, now, only a melancholy contrast to the political and mental degradation of the country of Pericles and of Plato. The perpetual freshness of the Literature of Greece;—the appeals that her Poetry and Eloquence, and Philosophy still make, after a lapse of two thousand years, to the feeling and reason of mankind, only confirm the belief that the Intellect and the Will have no *necessary* sympathy; but that the one may put forth its sublimest energies, while the other is the slave of depraved habits. For however greatly we may admire that intensity of character which distinguished the heroes of Greece, and which secured for her little states a most important political existence; we shall look in vain for the predominance of those virtues which constitute the morality of the soul. The love of popular distinction was with them the chief basis of all that was great and admirable in public conduct: but the unpretending sublimity of goodness; the graces which silently bless mankind, and look to conscience for their applause; these were, indeed, taught in the Academy and the Lyceum, but unnoticed in the general practice of the people. The sacred writings afford us the highest evidence of the degraded morals of Egypt and Greece. But even with no reverential bias on the judgment, no sacred object in enforcing purity of manners, we find a heathen, in a most dissolute period of society, holding up these celebrated people to the moral detestation of his countrymen. If Genius was always accompanied with an elevation of character, the glorious recollections of Egypt and Greece would have rescued them from such censure in the days of Juvenal. What then it may be asked, is the boast of civilization? On what ground can we claim exemption from the defects of those, who were eminent in Arts and Letters, Have we any cause for supposing that the intellect and the will are indissolubly connected and that improvement in morals must inevitably accompany our further advances in wisdom? Or, do we acknowledge that we are partakers of the same common nature;—and that the higher privileges, under which we now live, throw too frequently, the light of a more painful conviction on the want of a steady co-operation between the heart and the understanding? It would be difficult to deny the conclusion to which we are led by the experience of life, in answer to these enquiries.

But if we must not expect that the improvement of society in its most vital interests, will *necessarily* keep pace with the advancement of its knowledge and intelligence; we must not discourage exertion. If it be presumption to attribute too much to man, it is ingratitude to attribute too little:—it is ingratitude to the Giver of our capacities; and would tend to call in question the wisdom of his dispensations. While our experience, as well as the evidence of history, assures us that the mind may put forth its powers, without purifying the motives to conduct, we have no authority for concluding that moral degradation *must* result from the cultivation of our faculties. On the contrary, is not their existence a proof that they were intended for some great end; and can there be an end more consistent with all the suggestions of conscience and the wants of society, than the proper regulation of the affections and the will? If then, they fail of producing this effect, we may charge the failure to our own misapplication of those means of substantial improvement; and not suspect the highest of our earthly privileges to be the cause of all the disorder that disturbs the harmony of mankind. Does not the contemplation of the human mind, and the scene on which its energies are to be developed, impress us with that view of our destiny, by which Longinus has apologised for the bold negligencies of genius. And are we not ready to acknowledge that we are ushered into this magnificent world, as before a multitude of spectators, that we might admire its beauty and contend for profitable distinction in the general system. That we therefore possess a love of what is excellent— we long for something, even beyond our possible attainments.* Shall we venture to deny that such an intellect might be made most beneficial in its effects on morality, by a wise direction of its powers!

Without supposing then that moral perfection will be the certain result of cultivating the mind, the natural tendency of these endowments of intellect, points out to us, that we have to run a career of improvement; and that much unattained excellence is still the lawful object of our desires and emulation. We may and ought to look with rejoicing at every effort which is used in obedience to this suggestion of our nature.— Every advance that man makes, in the esteem of the wise and virtuous, is an encouraging testimony that he is fulfilling his allotted task. Although his progress will be stopped at an immense distance from that point of perfection, which theoretical philosophy has supposed attainable, and he must

* Ἡ φύσις οὐ τάπεινὸν ἡμᾶς ζῶον, ὀυδ᾽ ἀγεννὲς ἔκρινε τὸν ανθρωπον, ἀλλ᾽ ὡς εἰς μεγάλην τινὰ πανήγυριν εἰς τὸν βίον καὶ εἰς τον σύμπαντα κόσμον ἐπάγουσα, θεατάς τινας τῶν ολων αὐτῆς εσομένδυς, καὶ φιλοτιμωτάτους αγωνιςας, εὐθυς ἄμαχον ἔρωτα ἐνέφυσεν ἡμων ταῖς ψυχαῖς παντὸς ἀέι τõυ μεγάλου, καὶ ὡς πρὸς ἡμᾶς, δαιμονιωτέρου. Περί Ὕψους, *Cap.* 35.

experience many impediments which are overlooked in visionary speculations; yet he will have the satisfaction of knowing that he does his endeavours to keep mankind from degenerating, and that, in his little sphere, he is the promoter of individual and social welfare. Although he feels assured, by conscience and experience, that some change not within human controul, is required, to effect a complete reformation of the world; yet it is not for him to fix the precise limits of possible improvement—it is not for him to arrest the progress of society, even by his humility, or by his fears.

And yet such attempts have been made by the lovers of paradox, and the state of uncultivated nature, has been asserted to be more favourable to virtue and happiness, than that of an enlightened people. But such notions can have but few sincere disciples; for to exalt the savage above the civilized, is obviously to go back in the scale of being, and to convert the many causes for thankfulness, which spring from the daily blessings of life, into sources of distrust and apprehension. It is to destroy energy, and to foster a gloomy and uncharitable temper—to insulate man, in the midst of mankind; and to accumulate on him the miseries of an alien, in the very home, and amidst the very hearts, with whom God has linked his destiny. For the practical illustration of such a theory, we need only look to Rousseau himself—at once the Martyr and the Apostate—tinging with this dark notion the whole of his self-agonised existence, and yet often flying from it to court celebrity amidst the very world, whose institutions he pretended to despise. So inconsistent must the conduct always be, when the reason adopts notions so fanciful and extravagant. The imperious necessities of life will not suffer our actions to keep pace with all these eccentricities of theory. Incoherence will frequently betray the unsoundness of such reasoning. If it were not indeed for these obvious demonstrations of weakness, what mischief might not a commanding genius produce on the harmony of the social system.

The temperate view of our faculties, and of the advantages resulting from their improvement, offers us a prospect of blended light and shade; calling forth at once the virtues of hope and diffidence, which too seldom adorn the same intellect. To suppose that the mind must powerfully influence the conduct, is only to assign it the natural pre-eminence, by which it was made the delegated ruler of this lower creation. The wise regulation and culture of the mind must therefore be highly beneficial, and we may expect from it the happiest fruits. But man is not a being of pure intellect—he is made up also of appetites and passions which are often most powerful in persuasion, when the mind is weak in restraint. To impose upon these reluctant energies an authority

Qui fœdere certo
Et premere, et laxas sciret dare jussus habenas

is the great office of intellect; and unless it be so employed, its powers are, to individual welfare, worse than useless:—for it becomes treacherous to its important charge, and only increases the impetuosity, or allurements of those willing principles of evil, which are always sufficiently violent, and sufficiently seductive. The improvement of knowledge and taste undoubtedly affords the means of ennobling the moral character. But it would betray much ignorance of the actual state of human nature, to rely solely on acquisitions, which may be worse than superficial. It is not an acquaintance with the particulars of a science or an art—it is not Poetry, nor Eloquence, nor History, which can be made to bear often on the daily exigencies of life, so as to enlighten and determine the conduct. Neither is any general notion of right and wrong which we may derive from philosophical studies, more effectual, when real wants and inclinations influence the will.—How weak an instrument then must the mere diffusion of letters, of science, or of taste, prove, in bringing about that great moral reformation which benevolence would rejoice to anticipate. And yet how effectual in its tendency, toward some amelioration in the character and happiness of mankind, if with the extension of the means of acquiring knowledge, and intellectual enjoyments, the habits are also disseminated, which make knowledge and taste, as it were, essential parts of ourselves. Not those habits of exclusive and pedantic affectation, which serve only to pamper a momentary vanity, but those serious dispositions of mind and heart, which induce us to search diligently and modestly after Truth; and that, from a steady regard to the proper end of such pursuits—moral excellence.

In most discussions on this subject, the powerful effects resulting from the prevalence of mental acquirements, appear to be too readily assumed. We hear them spoken of as if they were the sole causes of the greatness or decline of nations—but surely it argues some forgetfulness of the history and constitution of man, to rank them so highly as the arbiters of human destiny. A little attention to the progress of our faculties, must convince us that many principles of conduct exist before the intellect is developed. The wants and instincts even of our infancy, and the impressions which may unconsciously be made by the conduct of those who watch over our helplessness, are perhaps enough to determine the complexion of the future character. For when the mind begins to expand it is too feeble, in its first efforts, to obtain frequent controul over the will; and in after life, it seldom entirely shakes off the restraints imposed by its early weakness. The mental character is therefore, originally, rather an effect than a cause; and when it operates upon the regulation of moral conduct, it only repays with interest what it had derived from the parent source.

If we look to the productions which have obtained the admiration of the civilized world, how decidedly may we trace this strength of moral prepossessions. The unusual vigour of intellect seems only to have afforded the means of giving an extraordinary illustration to the peculiar markings of character. The mind, unconscious of its dependence is obedient to those habits, which have served to give a bias to the affections; and we may often lament the unhappy celebrity which has thrown a veil of beauty over deformity, and bestowed elevation and dignity on those excesses which serve to degrade our nature. Nor can we complain that what is truly amiable and excellent, has been deprived of similar advantages from the triumphant efforts of Literature and the Arts. An immortality has been also given to some of the best and purest sentiments;—they have been brought before us, as if they were copied from beings, more secured from error, and more perfect in goodness than those whom we usually meet with in the ordinary intercourse of life: and they were indeed copied from minds influenced by a purer moral taste. In these instances, also, the heart has inspired the Genius.

But we need not look so high for proofs, that the acquired principles of morality most frequently give the leading direction to the suggestions of the intellect. The common experience of life must convince us, that what we often think a peculiar talent for any pursuit, is only the choice which the will prescribes to the judgment. And indeed how can it well be otherwise, when we consider the extreme difficulty of making retired pursuits predominate over the daily and hourly realities, which find so easy an access to the springs of conduct. There are but few who have any correct notion of mental labour. To abstract the thoughts from objects, which are every moment importunate in their solicitations, and to fix the mind's eye deliberately and attentively on its own conceptions:—to estimate them in all their relations and consequences; and then so to impress on us the result, as to make it become a part of our moral nature;—a principle of future conduct; clashing perhaps with many received and cherished habits:—this effort must be allowed to be extremely difficult; and yet, without this, we cannot suppose that the mind can effectually correct the perverseness of disposition.

By the manner in which information is most generally received into the mind, it is rather acknowledged as an accessary than as a principle. If our attention be directed to Literature, it is chiefly that we may acquire those graces of conversation and intelligence, which may make us acceptable in well-informed society, or qualify us for some specific employment. If we are engaged in scientific pursuits, they are usually regarded as satisfying natural curiosity; or as merely subservient to the wants of life; or as the means of individual distinction:—and the great lessons which they are so sublimely capable of teaching, are only incidentally inculcated. The Fine Arts, also, are too seldom considered as the means of improving our conceptions of ideal excellence, and bestowing a more exalted character on the moral taste. And thus, we are apt to forget that our own best interests, together with the general welfare and happiness, might possibly be promoted by a judicious application of our powers. The desultory habits which are encouraged by the wide diffusion of the means and facilities of improvement, are also calculated to weaken, and without much care, ultimately to destroy, the beneficial influence of knowledge. A careless perusal of opinions can have only a vague and indecisive effect on the character. Nothing indeed can be more idle than ordinary reading. The eye ranges over the page, without awakening the powers of comparison and judgment; and if the sense be tolerably understood, it is all that seems essential. The interpretation of the author's meaning is too often mistaken for the assent of the reader's mind; and thus every opinion seems to have equal weight, but, perhaps, not one leaves a decided and useful impression. The objects also which the professed lovers of intellectual pursuits most frequently propose to themselves, are calculated to withdraw the attention from that point which should be regarded, however distant, as the focus of human attainments.—Lord Bacon calls this "mistaking, or misplacing the last and farthest end of knowledge," the greatest of all the errors which impede its advancement; and he enumerates various prepossessions, that often divert us from a profitable use of our faculties; and in all of which we may find exemplified, the mastery that capricious disposition too readily obtains over the mind. "Men," says he, "have "entered into a desire of knowledge, sometimes upon a natural "curiosity and inquisitive appetite; sometimes to entertain "their minds with variety and delight; sometimes for or-"nament and reputation; and sometimes to enable them to "victory of wit and contradiction; and most times for lucre "and profession; and seldom sincerely to give a true account "of their gift of reason, to the benefit and use of men. . . . . ". . . But this is that which will indeed dignify and exalt "knowledge, if contemplation and action may be more nearly "and straitly conjoined and united together, than they have "been." *

To secure this happy combination, it is most essential that we should above all, cultivate the great principles of moral improvement:—that we should bring to our pursuits, not a mind freed from all prepossessions, but a mind subject to that best of influences, which will secure at least an honest application of its powers. If we expect such a disposition to grow naturally out of our pursuits, we shall certainly deceive ourselves. The goodness of Providence has placed at our disposal, a great means of advancing our usefulness and our happiness; and if we take care to cultivate that acute sense of what is excellent, which is the best protection of a vulnerable reason, and the surest guide of an erring judgment, we may look abroad through nature with the confidence that befits a manful exercise of our entrusted powers. We may explore the mysteries of science; we may range over the treasures of learning; we may indulge in the delights of imagination:—the moral sense will accompany our thoughts in all these excursions; and while it purifies the sources of enjoyment, it

* On the Advancement of Learning. Book 1.

will direct the attention to what should be the leading object of our pursuits—the regulation of the affections and the will. Although the experience of the world does not encourage us to hope, that we shall completely attain this desirable harmony of all our faculties; yet, let it be remembered, that we now live under peculiar advantages. While the means of knowledge are more generally diffused than at any former period, the private character is more an object of attention. Instead of aiming at an undefined and poetical idea of excellence, which has no relation to our present state, we are taught by Christianity to regard the realities of life, and the minute details of conduct; and such appeals are made, to the heart and conscience of each individual, that if he be not insensible, he must feel his personal interest in the general morality. But all these great assistances call on us for more than ordinary caution, lest we lose the good they offer. Let us studiously *begin* with the regulation of the heart; let it be our first and supreme care to bring it under the discipline of religion; let our diligence be worthy that sacred object of our ambition; and every accession of knowledge, will then be an accession of happiness—an accession of favour, in the sight of that Being, who can alone sanctify and render acceptable our defective services.

In offering these observations, I believe I have only given language to the sentiments of this Institution. It is not to obtain the unprofitable reputation of advancing novelties, that I have felt myself called on now to address you; but it has been my humble endeavour that the first discourse, delivered in this Athenæum, should declare the essential principles on which our Society is established—those principles, which are the surest bond of permanent union, and which can alone entitle our efforts to any attention and respect.

1.—GEOLOGICAL SURVEY OF SOME PARTS OF THE COUNTRY NEAR PLYMOUTH, PARTICULARLY BETWEEN THE PLYM AND TAMAR; BY JOHN PRIDEAUX, MEMBER OF THE PLYMOUTH INSTITUTION.

THIS limited, and possibly inaccurate, geological sketch of our neighbourhood, will, I hope, be acceptable to the society, both because the variety of rocks in so small a space, the diversity of their position, and their extraordinary exposure and accessibility, are of sufficient interest to deserve being known; and that it is well for institutions like ours, to be acquainted with the details of whatever concerns science in our own precincts, to lighten the labours of those who investigate on a broader scale.

The granite of Dartmoor, from Mist-tor to Hey-tor, and south of that line, has the following characters; which probably belong to the whole.

It is entirely mountainous, the highest hills being on the borders; where some of them attain an elevation of nearly 2000 feet. The valleys run in various directions; but have a tendency upon the whole, to the north and south line. The hills rise often steep, sometimes precipitous; their sides scantily clothed with long grass, except where rushes or moss indicate subjacent bog: and often strewed with loose blocks of granite, from 50 or more tons down to the size of a flag-stone. A crag, called the tor, usually projects at the summit of the hill, having a very striking appearance of stratification; the fissures being sometimes horizontal, more commonly a little inclined. This stratified character is not less general in the quarries; where, although there are none of those marked divisions, indicative of intermissions in the original deposition of the rock, the stone always comes out in beds. The dip is different in different hills, but seems to have a prevailing tendency toward east and south.

Not only the hills are higher on the borders, but in many places the granite seems harder there, and of closer texture. Hey-tor, Sheeps-tor, Collard-tor and Pen-beacon will illustrate this; as well as Calstock, the granite of which belongs to a more westerly projection. We must except, however, as will presently appear, the hill sides in immediate contact with certain rocks adjoining the moor.

The hardness varies, from such as almost to defy the tool, to that which falls to pieces by the blow of a hammer, or may even be cut down with a spade, like gravel.

The colour is not much more uniform, being generally pale grey or whitish in the mass, with a shade of red or yellow; but it is found, from almost black with schorl, to pure shining white: and some occurs of a rich red, superior in beauty to any Egyptian granite I have seen; particularly where it contains tourmaline.

That it is metalliferous every body knows: tin being the most common product. Copper sometimes occurs, and in a few instances, manganese has been mentioned; of which, as the miners have reasons for concealing it, I do not know the geological relation to the rock—whether it lies on the surface, or penetrates it in veins. Lead I have not heard of in this formation.

This granite is rich in schorl and poor in mica, consequently less impregnated with magnesia, and perhaps more subject to the operation of the weather than is common to that rock—circumstances which may help to explain its comparative fertility in grass. In summer it feeds great numbers of cattle; and in extremely hot and dry weather, when the herbage elsewhere is burnt up, assumes the appearance of great verdure; its humid soil and cold atmosphere, which at other times give it a pale and hungry aspect, contributing then to its fertility.

The close crystalline texture of the rock, obliging the condensed fogs and rain to run over its surface, is probably the cause, that the valleys are boggy; extending in numerous cases, up the hill sides and across the summit. These bogs, dangerous to cattle, are not without their value; being the great depositories of fuel; an important article in those bleak regions, where a fire-side is often agreeable in an evening of July. The peat gradually accumulated there, has attained a depth in many places, exceeding 20 feet. The deeper, the more it is prized: the lower portions, condensed by the superincumbent weight, becoming a much more effective fuel.

Springs commonly break out from these bogs, as though superficial to the stone; but there are intances of a different kind—on the eastern foot of Ugborough-beacon, is a fine spring, pouring out of the rock, probably two hogsheads a minute. Such as these may perhaps owe their origin to another condition of the granite, where the crystals of quartz and felspar are incoherent, and the schorl has very much disappeared, forming a sort of gravel many yards in depth. Such a bed of great extent, lies on one side of Hessary-tor, near the prison.

In wood, this rock appears to be unproductive. A few young plantations of fir do not yet appear to suffer more than might be expected from the climate; some fine trees are found about the borders of the streams; and trunks of considerable dimensions, have been dug up from the bogs: but it is said by gentlemen possessing estates on the granite, and my observation agrees with it, that trees, after reaching a certain height, rise no farther; spreading and twisting their branches, without proportionate increase of trunk. Wistman's-wood, a plot of oaks, supposed to be of a thousand years standing; the largest less than a man's waist, and within twenty feet high, is an extreme instance.

The outline of the granite, from Tavistock to Hey-tor, southward, may indeed be almost traced by the coppice, which clothing the declivities of the slates and other rocks that abut against it, disappears suddenly on its gritty soil.

Entering the moor from Tavistock, Cocks-tor, a trapp mountain must be passed, before we reach the granite at Staple-tor. Thence it runs a little westward of south to Pu-tor, two miles; to Crip-tor, east one mile; to Sheeps-tor, south five miles; whence it leaves a deep curve, occupied by a hill of schorl rock, with some slates, (Ringmoor-down,) and comes out west again at Wigford-down. At Dewerstone, the southern angle of this down, and S. W. point of the Dartmoor granite, it is finely exhibited in a vertical cliff of probably one hundred and fifty feet, down to the bed of the river. Hence E. S. E. about two miles to Collard-tor; N. by E. three miles to Pen Beacon; E. one and half mile, and as much S. to Blatchford-hill; and about S. E. by S. to the Western-beacon, full four miles. This is the southernmost point; thence about two miles N. E. by N. to Ugborough beacon; about four miles in a concave line N. by E. to Shipley-tor; thence a little westward of north, about seven miles to the Dart. From Sharp-tor, on the north bank of the Dart; N. E. by N. about four miles to Widecombe; S. by E. about the same distance to Rippon-tor; and doubling back N. E. by N. three miles to Hey-tor; which is probably its easternmost projection. Mudge's map may be referred to for these points.

Gneiss has no where occurred to me, within this range; but the slate, where in contact with the granite, is often micaceous—as at Meavy, Shaugh, Black-alder-tor, Hey-tor &c. These micaceous slates extend but little way from the granite, clay slate succeeding; though usually separated by an intervening valley. At Black-alder-tor, the mica slate merely covers the granite like a peel. The only place I met with, where the soil on this slate was extensive enough for cultivation, is at Hey-tor; where it appeared to yield good crops of corn.

In other cases, as at Collard and Walkhampton, the slate in contact with the granite is not spangled; but has a general glimmering surface approaching to that of talc, without the unctuous feel of magnesian minerals. This slate is not unfavorable to agriculture.

On Yanadon-down; from the Western-beacon to Ugborough beacon; and in a larger tract from Dean to Holne, a hard stony slate bounds the granite. This rises into steep and high hills, unfertile, except in wood. It dips regularly away from the granite, at different degrees of declivity, but generally steep.

Great part of the way from Ugborough-beacon to Deany-wood, and again on the north side of the Dart, the granite is bounded by a rock running into all its creaks and bays, and rising into hills of no great altitude. This is a killas, with the texture of fine clay slate, but little of its laminar structure. It differs from the ordinary appearance of greywacke, here; but is known to the country people by the same appellation "Blue Dun," and sometimes passes into more decided greywacke, at a distance from the granite. It is very regular in dip; reposing upon the sides of the granite; but the point of contact never occured to me, though sought with care to ascertain whether any thing like amalgamation took place. In many places, the separate rocks jutted out within thirty yards of each other; yet a detached fragment only could be found, wherein they are in contact. In this fragment the division is an abrupt line; the killas deep iron grey; the granite pale buff, with the aspect of imperfect crystallization; distinguishing the granite of veins in Cornwall. In several parts where this killas is the boundary, the same condition of the granite occurred; and also where it comes in contact with the stratified iron ore, at Hey-tor.

This killas is highly fertile, differing singularly from the adjoining granite. In no place is this more remarkable, than at Buckland, on the Dart; where the killas runs in a trough between two granite mountains. The vivid green of its turf and the rich wood running up the acclivities, contrast strikingly with the pale herbage and bald crowns of its overtopping neighbours. It appears amidst the slate in Holne parish, and the different value of the land, marks its superior fertility. At Yolland estate, at the foot of Shipley-tor, some fine trees appeared in the midst of the granite; on approaching them, they were found to be growing on a patch of this killas, not a tree spreading out to the granite on either side.

I have heard of no metallic veins in this rock: and, although it exhibits no striking marks of stratification, presents no vestiges of organic remains, and lies immediately on the granite; it appears to me to be a transition rock, belonging to the greywacke family.

In several places the moor is extended by high hills of considerable dimensions, composed of various compounds of schorl, quartz and claystone, or slate. Ringmoor-down, parts of Wigford and Roborough-downs, Crownhill-down and several others, are of this kind. In some cases these rocks are compounds of decided crystals of quartz and schorl; in others of granular combinations of the same ingredients; sometimes of particles so minute, as to be difficult to distinguish by the aid of a microscope, forming a hard, nearly black, stone; and most commonly of this black variety, striped and spotted with veins or crystals of white quartz, and sometimes with claystone or slate. This rock yields a poor soil, but much better than granite; the natural herbage on it affects a deep brown colour, from short shrubs and furze. All the varieties are known to the miner by the name of caple, and yield both tin and copper. Lead in a very trifling quantity is found in it.

I have been unable to find a point of contact between these rocks and granite; but as the black variety often runs in distinct veins into the latter rock, they probably do not pass into each other by gradual transition. Loose blocks of each lie tumbled together about the hills, at Blatchford and elsewhere. The road from Cadaford-bridge to Cornwood runs over a long hill, between Saddlesborough and Trowlsworthy-tor, where not only blocks but gravel of each rock mingled together, seem to form the hill, without any solid rock; and it is difficult to say which predominates. The soil formed of this mixture grows wood pretty well, but does not appear to have been much cutltivated.

The bounding rock, remaining to be noticed, is trapp; Cocks-tor, before mentioned, is the first mountain where this occurs; and it runs north to White-tor, Brazen-tor, and probably much farther. It is almost pure horn-blende, in different degrees of compactness, and consequently, of specific gravity.

At Cocks-tor, and White-tor, it comes in contact with clay-slate—at Brazen-tor, with granite. Clay-slate occupies the western side of Cocks-tor, and forms a ridge near the summit, where it comes into contact with the trapp. This ridge still preserves its laminar structure, but instead of its argillaceous aspect, has assumed that of flint, and gives fire under the hammer. In many places it is become ribband jasper. Similar ribband jasper, but finer, as a mineral specimen, is found in blocks, at the foot of White-tor; produced, in all probability, in the same manner.

At Brazen-tor, where the trapp and granite join, the points of contact were, as often happens, hidden by turf. It is however, worth notice, that on the side of the granite next the trapp, it is distinguished by the intermixture of nodules and veins of granular schorl and quartz; the granite itself assuming the red colour, usual here when tourmaline is present. Whatever may be the natural relation between schorl and horn-blende; in this instance, the minerals are sufficiently distinguished by the lesser hardness, ready fusibility, and greenish fracture of the horn-blende.

These trapp hills are higher than the granite next to them, the dip not very decided. Cocks-tor appears, in several positions to dip south east beneath the granite; and such is the appearance at Brazen-tor—the granite itself seems to have a prevailing dip in the same direction; and its south eastern side, having every incurvation filled in by the slates or killas, appears to have been at rest from the period when those rocks were deposited. It might be inferred, that the trapp had heaved the granite mass on the north west; and gushing out from beneath, had partially fused the edge of the slate which supported its other side: but as the dip of the trapp is not plain, and the granite hills are not highest on the north west, this conclusion can hardly be borne out so far as that rock is concerned.

There is another instance of this action on the slate. On the slate hill looking down on Ivybridge from the north, a ridge near the summit is of very beautiful green and white ribbon jasper: whilst the highest peak is of sienitic greenstone; which judging from the colour of the herbage that conceals the rock, extends for a mile or more back to the granite.

Just above the weir-head of the Tamar, is another granite hill, called Calstock Granite; from that being the nearest town to the quarry: it is the easternmost point of a Cornish range; dips south-east by south about 20°; is greyish white in the mass, small grained; of limpid quartz, black and brown silvery mica, spicula of black schorl and grains of translucid tourmaline, with some long rhombs of felspar, cemented together by the latter substance, irregularly crystallised. Reposing on this, south, is slate of a whitish yellow colour, breaking into large rhombs; the laminæ having a nodular or uneven face, not clearly micaceous.

South of this slate are Morwell rocks; very hard primitive slate, and having in some parts a striated or fibrous, in others a sort of glimmering speckled appearance. Thence all down the Tamar, almost to Saltash, we have a succession of palish grey slate, dipping south, and becoming gradually softer and tinged with green, as we proceed southward. At Cotehele, we find the deep iron grey slate only, spangled in some places with mica. It laminates pretty freely; breaks into rhombs; and is connected with, if not traversed by beds of hard grey stone, of fine granular quartz and schorl; having also a rhomboidal fracture in the large, but granular in the small. This slate seems to dip away from the western granite, whence it is distant three or four miles. The beds of granular stone strongly resembling greywacke are probably a crystalline deposit; for I found no indication of the slate being other than primitive.

After passing Pentillie (south) the slate is looser in texture, brownish; and having all the appearance of the transition slate which alternates with our limestone. Near Saltash, we have on both sides of the river beds of granular greywacke pervading the slate, and a few thin beds or veins of limestone; and this alternation continues on the east bank down to the Dock-yard, where the limestone formation commences. In fact, the eastern bank from the weir-head downward, is generally slate dipping south; and it is remarkable, that the dip increases as we recede from the granite. Morwell rocks scarcely diverging 10° from the horizontal line, and those near Saltash approaching almost as near to the vertical.

A line drawn from the granite at Calstock, to that at Sheeps-tor, will lie east by south, aud pass I believe, entirely over slate, of varying dip, not only in declivity but in direction; each hill often differing in these respects from the next. Sometimes it is disturbed in the same hills by clefts and veins. These irregularities might have been expected, from the position between two granite eminences, as above mentioned. This slate varies in colour; whitish, greenish, red, grey: the two first rising high, pervaded with quartz, and little productive; the grey, soft and fertile; and the red, where not too cold from elevation, perhaps still more favorable to agriculture. The grey, forms much of the fertile soil, toward Tavistock; the red, round Walkhampton.

Just north of this line, on Morwell-down, are blocks of coarse porphyry, with rhombs of reddish buff felspar; the rock in situ occurring to the miners, probably underneath the slate; for though these blocks lie about upon the slate, for some miles, the rock itself did not fall in my way. The same porphyry is, however, found at Grenofen, three miles farther east, about a mile north of the line above stated; where it is quarried for mending the road, and again in larger quantity about Walkhampton: it breaks into flat pieces, and seems to yield to the weather. The superincumbent soil, at Grenofen and Walkhampton, is fertile; but whether from greater elevation, or from the porphyry being covered with hard slate, I did not observe this character on Morwell-down. North of Grenofen, slate prevails both eastward and westward; the country about Tavistock, however, still needing geological investigation, for which it presents an interesting field.

Southward of the above stated line, the entire peninsula between the Tamar and Tavy is slate; dipping almost uniformly south; and becoming softer and less elevated as it proceeds southward from the granite. In the northern part of this peninsula, some is gritty and whitish, other softer and grey; but more generally it is hard and greenish, with white quartz veins, and strewed with snow-white bowlders of the latter substance, retaining sufficient marks of their origin; which having withstood the atmospheric depredations on their kindred slate, were probably rolled about and rounded by the deluge. Some very large and heavy masses still retain their native position, protruding their white shoulders through the slate. These bowlders disappear before we reach Beeralston; and the hill tops, wild and unproductive from the hardness of the stone and want of shelter, present a fine contrast with the lively green of the southward view, down the valleys bordering the Tavy, and the wooded sides of their low hills; all of soft slate. This slate is metalliferous, the country being pierced with mines of tin, copper, lead and silver, almost from Tavistock to the confluence of the two rivers.

East of the Tavy, and between that and the Mew, the wild elevated tract under several names may be generally included under the term of Roborough-down. Distinguished from the neighbouring granite, by the greenness of its bordering valleys, and the copse covering its declivites, it is again a slate formation. The predominant dip is westward of south at least 40°, but the positionis a good deal disturbed; and it is intersected by other rocks in several places.

At the point where the road turns off to Dartmoor prison, just above the western elbow of the Mew river, is a remarkable projecting rock, rising out of the slate. It consists of quartz, slaty lamina, iron ochre and schorl; forming a caple of the miners, and appears to be a vein pervading the slate; its prominence due to its superior power of resisting the weather. It runs nearly westward across the down, exhibiting the general dip of the neighbourhood, though probably not twenty feet wide; similar appearances, on a smaller scale, occur in other parts of the down.

Southward of this, running from nearly opposite Hoo Meavy to Bickham, is a bed of singular porphyry, with no defined dip; bowlders of which are strewed about the down so extensively, as to have acquired for it the name of "Roborough Down stone." It is almost white on fresh fracture, becoming brown by the weather, and is full of small cavities, seldom exceeding 0,1 inch diameter. It is thinly disseminated with minute crystals of limpid quartz; and the cavities, which appear to be cubical when regularly formed, contain in some instances, remains of the matter with which they were originally filled.

The cement, forming nine-tenths of the stone has an earthy fracture; yields, when scraped, a powder sparkling with a micaceous aspect; and is very imperfectly fusible before the blowpipe. It is perhaps mica, in a very fine granular form, if such an appellation be permitted. The same rock appears again, west of the Tamar, at Harewood, where it is quarried: but the quarry presents only loose buried blocks. On the south eastern angle of the down, towards Shaugh and Bickleigh, we have the hard black or marbled compound of quartz and schorl; and lower down approaching the river, gritty slate, spangled with mica: neither of which rocks I could find exposed, so as to distinguish its relative position; though the black rock often protrudes angles through the turf, and detached fragments of both, cover the ground.

After leaving Roborough-down, the whole country between the Plym and Tamar, for two miles south, is slate, generally hard, with a regular southerly dip; traversed by a single bed of compact felspar, which is cut by the rail-road near Fancy, where it is not above thirty feet wide; and by broad veins of quartz.

About two miles south of Bickleigh, the Plym river cuts a bed of excellent roofing slate, worked to a considerable extent on both its banks. Cann quarry, the eastern working, presenting a beautiful picture, from the rail-road. This slate has the conformable steep southerly dip—its natural surface is clothed with wood.

A short distance south of this, the rail-road cut out of the hill sides parallel to the river, lays open an extensive rock of greenstone. There is a little contortion of the slaty lamina, as it approaches this greenstone, and the slate itself becomes pale green; a colour which continues, where the rock loses the slaty form, and becomes fine granular. As the grain becomes coarser, the colour deepens; until the rock acquires a deep green hue and rough granular texture: little white blades of felspar shewing in some parts; and black spots of hornblende becoming evident when a piece of the stone is breathed on. There is, in one place, an appearance of dip south westward about 80°; but the cleavage lines are generally too irregular to put much confidence in.

It rises into hills, not so high as the slate; the soil upon it being fertile. The twin hills, on which stand the houses of Rock and Estover, are composed of it, and it probably extends no farther, for I could not find it at the distance of a mile from the river, in any direction. It is all around bounded by slate, passing into it by the gradual transition above described, wherever the limits appeared. The greenstone seems to be an intruder; not however exhibiting the decided marks of igneous action said frequently to accompany it.

About the same parallel commences a formation of greywacke; its northernmost point being near Knackersknowle; and mixed with a soft slate; each often passing insensibly into the other, forming the high ground which branches out one mile and half west by north to Honiknowle; again the same distance west to Pennycross; and again three miles south west to Swilley; where it is extensively quarried. The southern boundary runs in a curve line to and across the top of Townsend-hill, where a ridge appears to mark the limit, to a hill just south of the village of Crabtree, where a similar ridge is seen, at the quarry, to indicate the line of separation from the slate. The greatest breadth of this greywacke from north to south may be two miles; from east to west it runs four miles at least; and as we have it again just behind Saltram, it is probably connected with the similar rock which appears as has been already stated, to follow in some places, the outline of the moor. Here, as elsewhere, the soil on the greywacke is of distinguished fertility; and particularly where it is in contact with the slate.

This greywacke, here called "Dunstone," is generally compact, and hard enough to make a good roadstone. It suffers from the weather; particularly where it happens to present an eastern face, south of the granite; mouldering and becoming honey-combed, the hollows containing ochreous matter. It is often disseminated with amygdaloid granules of limpid crystallized carbonate of lime, and sometimes of black schorl—and it generally returns the odour distinctive of hornblende, when breathed on. Veins of quartz accompanied with pulverulent black oxide of manganese often occur, particulary in the slaty portions; and the latter substance occasionally fills the pores of the exposed rock; instead of the ochreous matter abovementioned. It is very fusible before the blowpipe, which joined to its susceptibility to the weather, seems to indicate its containing an alkali.

A distinction appears between the slate belonging to the dunstone, and the transition south of it, particularly the blue slate. At Crabtree, this blue slate comes in contact with the dunstone, (which at this point is granular,) with an abrupt line of division; and yet this same slate is found in amygdaloid formations, in the body of the dunstone itself. They are formations, and not breccia; because their surfaces are ill defined, and the lamina of the different nodules, far apart, are parallel with each other, and with the slate rock. This seems to mark a particular disposition to separation: whilst the Dunstone slate often passes so gradually into the compact rock, that two observers will hardly agree where the line of separation should be drawn.

A detached bed of greywacke is quarried behind Mount Tamar House, half a mile south of St. Budeaux. It runs in thin beds, or veins, through the slate, to Saltash, as has been before observed. This greywacke is granular, and has so much resemblance to the last named greenstone, that judging from our own neighbourhood only, I should have felt disposed to assign to these rocks an allied origin.

No metallic veins have been observed, in either the greenstone or greywacke.

A hard black rock, with white quartz veins, called by the country people "Blackacre." very different from greywacke, sometimes caps the slate hills. It is most conspicuous at Warleigh-tor; where it lies comformably with the slate, and laminates in some parts. I do not know that it requires particular notice; being perhaps nothing but slate, with a large proportion of silica.

The clay slate at Cann-quarry seems to draw a line of distinction, between the harder, traversed by broad quartz veins, which lies north of that bed; and the softer and more fertile to the southward. To the latter there is perhaps an exception at St. Budeaux: where, although not deficient in fertility, the slate assumes a hard and somewhat nodular texture; much like that of Morwell rock. It rises high and steep, and looks like a hill of primitive slate protruding through the transition rocks. It is accompanied by two other insular rocks; each appearing in only one small point; and no where else within the compass of this sketch.

The first of these is a felspar or porphyry, with a decayed appearance, full of cracks: and pervaded by spiculæ of schorl, sometimes an inch long. It rises at the corner of a field, just where the King's Tamerton road forks off, from that leading from St. Budeaux to the Saltash turnpike; and has a dip south-east, or even more easterly; the strata around it dipping westward of south. The other appears at the angle where the St. Budeaux road joins that turnpike; occupying again the corner of a field, as a sort of quarry. It exhibits rounded masses, looking not unlike granite bowlders; some projecting from the soil, where it is cut down to a vertical face. the others standing up from the rock beneath. In the latter is some appearance of cleavage, corresponding with the dip of the country. The blocks projecting from the soil look as hard as any, but a kick disintegrates some of them entirely; and when cut down with a spade, they exhibit concentric lines, appearing to decay in irregular balls—whence doubtless their bowlder-like appearance. The soil, formed of the disintegrated rock, looks something like a soft micaceous sand; but being compressed, and again shaken loose, the glistening disappears, and it shews a soft, free soil. Round the rock it appears very fertile; but there is no clear indication how far it extends beneath. The stone is composed of a very fusible mica, brown and semimetallic in appearance; and granules of white felspar: whence the granitic appearance above noticed.

From the south of the greywacke, slate, dipping generally south, and covered with a fertile soil, occupies all the country till we reach the limestone. At the Lary-bridge we see at once, the different form of the hills of slate and limestone; the different level they attain; the alternation between the two rocks at the point of contact: and after continued dry weather (a rare condition here, between the Atlantic and the granite peaks) the different character of their soil, in the colour of the turf.

As the slate approaches the limestone, tables of limestone lie in it; and as the latter becomes predominant, it is pervaded with slaty lamina, for a considerable distance. Where in contact the two rocks are conformable in position; but the limestone in other points, is less regular in dip than the slate. The hills of limestone are much less elevated than those of slate, and whilst the latter rise gently from the south and fall steep northward, those of limestone assume a contrary inclination. The soil on the limestone is thin, and dries quickly; that on the slate deeper, and retentive of moisture: the lime being the most fertile, except in dry weather.

No organic remains are found in the rocks northward; nor in the slate, until just about its junction with the limestone. Even there they are so rare, that I have met with none *in situ;* but encrinal columns have been found in the slate by the Rev.

Richard Hennah, F. G. S. In the limestone they are abundant; and in the copious collection of that gentleman, offer novelty as well as variety to the investigator. In the hope that this paper will be soon followed by one from him, on the organic remains of our limestone, I leave that part of the subject entirely in his hands; conscious that from inclination as well as opportunity he is better qualified for it than myself. Catdown and Teat's-hill are entirely limestone; which very soon after parting from the slate, assumes a reddish hue, from the presence of siliceous matter of that colour. This presently after, appears in bulk in thecharacter of the old red sandstone; alternating with the limestone, south, though much less strikingly than the slate does northward. The Hoe also is limestone, as well as some of the south part of the town: but it is the mere ridge next the sea, in this place; for the new houses in Lockyer-street, are founded on slate. Westward it passes farther inland. The new Crescent is founded on the alternation of slate and limestone; and at the back of Millbay, we have the latter rock extensively quarried, and rising into respectable hills. As we go on to Devonport, we have it on the south side of the road, and slate on the north. Very little of the town of Devonport stands on limestone; greywacke running so far south there, as to form the hill, on which is built the new Town-hall. The limestone terminates west, with Bunker's-hill, in the Dock-yard.

There is a marked diversity in our limestone; in texture, position, and contained animal reliques. The eastern is probably the oldest, and the western the newest deposit: but the consideration of this subject may more properly belong to Mr. Hennah's paper. I will only observe here, that if it prove so, our limestone is a different formation from that farther east, which Mr. De la Beche refers to the carboniferous series. This is also probable from its direction here, which is rather southward of east, as well as from the more crystalline appearance of the stone.

Devil's-point, parallel with an outlying rock at Mount Edgcumbe, and the Peninsula of Mount Batten, is the southernmost projection of this limestone; and not only contains a good deal of red sand, in its texture, but is traversed by conformable beds of unmixed red sandstone; one of which 20 feet thick, was laid open in digging away the ground for the new Victualling Office; and others, smaller are visible in several places.

As just stated, there is a small deposit of limestone at the northern angle of Mount Edgcumbe; and on the opposite side of the harbour, Mount Batten, is a hill of the same material: these two outliers forming an east and west line with the limestone projection at Devil's-point, and at the Oreston quarries. The soil upon the limestone is abundantly productive, in our moist climate. The rock is not metalliferous in any part of this range. It contains numerous cavities, lined in many cases, with stalactite of delicate and beautiful forms. In some instances they are partly filled with clay; mixed up, in a few cases, with bones, having the characters of diluvial reliques. A greater number contain water; the largest, under the quarries by the Marine barracks, forming an immense reservoir of fresh water, into which a stream is heard to pour. Some particulars of this cavern, with a wood cut, may be seen in the Plymouth Herald of June 30, 1827. It may be sufficient here to mention, that its extent is such as to require a boat for surveying the interior: at present it is inaccessible.

Hitherto we have found a tolerably regular disposition of the strata, from the granite upwards; farther south, on the sides of the harbour, we find the greatest disturbance.

At Mount Batten, the limestone lies nearly vertical; in some places even overhanging south. The hill south of it, is soft slate, dipping generally southward, though in some places irregular; and behind, appearing even to dip north-east, under the limestone at Turnchapel. A ridge of dunstone runs through it toward St. Nicholas' Island, which is of that stone, much disturbed in position; the predominant dip northward, unless the strata overhang. The adjoining reef of rocks, the bridge, appears to correspond; and as might be expected, a similar formation occurs at Mount Edgcumbe; where, however the stratification is less disturbed, dipping westward of south. The southern part of Mount Edgcumbe corresponds with Staddon-heights; both running high, to nearly the same level; and being alike composed of well defined strata of slate, dunstone and red sandstone, mixed together and dipping in different directions, and at different angles. Flakes of sandstone, on the eastern side, eight inches thick, and some yards long, copiously veined with white quartz, having slipped off, and lying rolled together, for 100 or 200 yards along the coast. These rolls look, from innumerable cracks on the convex side, as if they had fallen in a tough state, from igneous semifusion. Such appearances, on a smaller scale, occur also at the island; but not on the Mount Edgcumbe side. Turning the point into Boveysand-bay, there is a projecting ridge of very hard dunstone, over which the sandstone and slate hang saddlewise. It looks as if it had heaved the others, till the strata fell over, as above described; a case not very probable, as the corresponding formation at Mount Edgcumbe reaches the same level, without any similar appearance.

In the country behind Staddon-heights, I found stone looking like the passage of greywacke into red sandstone; but it is so covered with turf, that we cannot trace one into the other.

South of Boveysand-bay, is red sandstone without much admixture; dipping irregularly to the south eastward. A ledge projects from this, into the sea, called the Shag-rock.

This is of white quartz, with streaks and patches of red sand; and appears to be a vein, hard enough to have resisted the encroachments of the sea on its matrix. On the western side of the harbour, we find the same sandstone, occupying Cawsand-bay and the hill behind; but standing nearly vertical; the strata running south-east and north-west; but diverging a good deal on both sides. The Cawsand-bay sandstone is deeper red, and has little cavities, some of which are filled with white nodules; and the same white substance also variegates and interlines it, in some places, looking not unlike mortar.

The Northernmost beds of sandstone break into obtuse rhombs, fit for street paving; for which purpose that on the eastern side is quarried.

The coast south of Cawsand-bay, to the Rame-head is greywacke slate, and greywacke, in very distinct vertical strata. In one place where the ends appear, two or three feet thick, it looks not unlike columnar basalt, at some distance. The Mewstone, on the eastern side, does not correspond with this; being composed of red sandstone, and a rather gritty slate, full, in some places, of pale greenish nodules; perhaps organic reliques, for such have been found on that side the harbour, both in slate and sandstone. It is equally dissimilar in dip; that of the Mewstone being south by west about 45°. The strata are laid open by the sea and weather, in such an extraordinary way, that they look as if displayed by art, in tables for exhibition. Unlike the exposed heights of Staddon and Rame, the face of the Mewstone, corresponding to its dip, is by the direct impact of the Sun's rays, and its lower level, covered with luxuriant vegetation, and perfumed, in summer by numerous wild flowers. Here these formations end: the coast on both sides for some miles, east and west, being composed of slate and sandstone.

Southward, no farther distant than the Eddystone, we again find the granite, with a very decided steep south westerly dip. One rock, on which stands the light-house, and that one only, is gneiss; dipping less steep, in the same direction: this single rock of gneiss being the only one I have heard of in England.

The whole series from the old red sandstone upwards, is wanting here. Diluvium we have in a few caves of the limestone, as before stated; but no where on the surface: alluvial marsh lands, are extensive and increasing.

It was observed, that the hills of mixed slate and sandstone, forming Staddon-heights and Mount Edgcumbe, though irregular in formation, and a mile apart, reach the same level. The same may be observed of the limestone, which, though intersected in several places, forms a ridge from Mount Wise to the Oreston quarries, almost as level as the top of a wall.

The limestone hills have a gentle ascent on the northern side and dip steep to the southward; the position of the slate and greywacke hills is the reverse of this: the greywacke often showing its place by a ridge along the hill. Except the limestone, the whole country rises gradually toward the granite.

The principal water courses, the Tamar, Tavy and Plym, cannot be taken as indications of the general direction of the valleys. Amongst the greatest irregularity, east and west, corresponding with the general run of the strata, have the predominance. And if the north and south valleys of the Plym and Tavy, be principally, and that of the Tamar partially, the effect of heavy currents, at, or prior to, the general deluge; some of the smaller valleys in that direction, are original; the strata lying in different positions, on the opposite sides. That of the Compton brook may serve as a familiar example.

CATALOGUE OF GEOLOGICAL SPECIMENS, FROM THE ROCKS ABOUT PLYMOUTH.

A Granites of Dartmoor, &c.

1 Common granite 2 Finer ditto Haytor and Calstock 3 Red ditto Trowlsworthy &c. 4 Compact ditto Pen-beacon (south) 5 Granite. Bed of the Erme (farther south)	Dip (of greater cleavage) variable: generally southward of East. Metalliferous. Mountainous; vegetation scanty; no wood. A crag usually projects at the summit; and often at the sides.

B Rocks bordering the granite of Dartmoor.

1 Horn-blende rock Cockstor, &c.	Dip uncertain; perhaps south by east, or more east: and if so underlying the granite. High mountain; vegetation scanty. Craggy summit.
2 Varieties of schorl rock Roborough, &c. &c.	Dip variable, and difficult to determine—Metalliferous—Hilly—Summits bleak and rather bare—Valleys and hills sides clothed with coppice—Soil often deepish.
3 Quartz rock, with claystone or clayslate.	"Caple" of miners—Metalliferous. Agricultural characters as B 2.
4 Micaceous slate. Haytor, Shaugh, &c.	Quantity exposed small, generally reposing on the granite; but having some appearance of underlying Shaugh-tor.
5 Micaceous, passing into clayslate. Cotehele.	Dip south east: appearing to rest against Kit-hill—Abounds in Cornwall—Hilly—Fertile; covered with fine wood.

6	Clayslate. Morwell-down &c. &c.	Dip generally south—Metalliferous Hilly—Agricultural character rather more favorable than B 2.
7	Compact clayslate. Killas. (Greywacke) bordering the moor for an extensive range.	Dip right away from the granite; on which it reposes. Not Metalliferous? Hilly; but less so than the above—Extremely fertile—Wood remarkably fine and rich.
8	Ribband jasper. Ivybridge &c.	The edge of clayslate, in contact with trapp.

C Rocks (primitive) not in contact with the granite.

1	Fine clayslate. Cann-quarry, &c.	Dip south—Hilly—Sides and summits covered with copse, or fine wood.
2	Granitoid porphyry Walkhampton, Grenofen &c.	Dip about south by east? reposing on slate—appears to form Grenofen hill, which is fertile and well wooded.
3	Porphyry, with base of compact mica, or claystone. Roborough.	Dip difficult to determine, probably eastward of south—Reposes on slate—Metalliferous.
4	Felspar rock Rail-road, near Fancy, Collard, Blatchford &c.	Narrow beds running through the slate; exhibiting no distinctive agricultural characters.
5	Greenstone Rail-road	Dip not plain; connected with slate. Appears to form the fertile hill of Rock and Estover estates—well wooded.
6	Finer greenstone, slaty; same place	Characters as C 4; passing into Clayslate.

D **Greywacke formation, up to the limestone.**

1	Compact greywacke Manadon-hill, Swilly &c	Dip not usually distinct; where visible, south—Reposing upon slate—Forms a range of high ground, running north and south from Knackersknowle to Townsend-hill; and from Swilly, west, many miles eastward—Highly fertile and well wooded—Not metalliferous.
2	Granular greywacke Mount Tamar, Crabtree &c.	
3	Greywacke slate; between the greywacke, and limestone	Dip south; reposing on D 2.—Forms Lipson-hill, Northill, and all that line east and west. Rather retentive of damp; but sufficiently fertile.
4	Siliceous Slate	Dip south; reposing on greywacke slate; forming Warleigh-tor.
5	Rude porphyry	Detached rock, near St. Budeaux. Dip south east.
6	Micaceous greywacke?	A small bed, a little south of the above: dip south—Soil fertile.

E Rocks of the shore.

1	Limestone, with corallite &c.	Dip not quite uniform; generally south—Reposes on greywacke slate, with which it alternates, north, as it does south, with red sandstone, which lies above it. Forms a sea boundary of low hill covered with a fertile soil; but thin and subject to parch in summer Not metalliferous.
2	Ditto with univalve shells	
3	Ditto with bivalves	
4	Greywacke Drake's Island	Dip quite irregular, and apparently disturbed: yielding to the weather.

5	Greywacke Boveysand Bay	Dip uncertain; appearing thrust up from beneath; and to have heaved the red sandstone strata saddlewise.
6	Ditto passing into red sandstone.	Little exposed; dip variable and irregular: apparently disturbed by heaving from beneath.
7	Red sandstone, compact, Mount Edgcumbe and Staddon-heights	Dip irregular, often vertical in Cawsand-bay, where it is interlined with white sandstone, looking like mortar. The course of the beds also irregular; but having a prevailing tendency south east—Slate is generally intermixed with it.
8	Ditto porous Cawsand Bay	
9	Greywacke slate Jenny Cliff, Mewstone, Penlee and Rame	Dip, at Jenny Cliff and Mewstone south west—at Penlee, it is vertical—that at Jenny Cliff and the Mewstone is intermixed with sandstone.
10	Rock quartz; Andurn point to the Shagstone	A broad vein of compact quartz, running through the red sandstone and having resisted the encroachments of the sea on its matrix.

F Rocks of the Eddystone.

1	Gneiss House rock	A single rock, probably 200 feet square; I believe the only gneiss in England. Dip, south west.
2	Ditto, passing into granite	Dip south west. The rocks nearest the gneiss contain the largest proportion of felspar; and have the most laminar texture.
3	Granite	


Little Duke Mine
Virtuous Lady Mine
R. Tavy
Lophill
Warleigh
Tamerton Foliot
Devils Pt
Redding Point
Point

II.

EXPERIMENTAL INQUIRIES CONCERNING THE LAWS OF ELECTRICAL ACCUMULATIONS, BY MR. W. S. HARRIS, MEMBER OF THE PLYMOUTH INSTITUTION.

1. The peculiar arrangement of an insulated and uninsulated conductor exemplified in the construction of the Leyden Jar, appears calculated to develope, in a satisfactory way, many important properties of electrical action; it has consequently undergone, at various periods, so much investigation, that it would seem difficult to give any new interest to researches in this interesting department of science; but after a long series of observation and experiment, carefully compared with the present advanced state of our information, I am led to believe, that the following paper, will be found to contain some new and important facts, which appear hitherto to have escaped observation; and, I may therefore hope, that it will not be deemed unworthy of the Society's attention.

It may not be improper or uninteresting, before I proceed more immediately to the experimental inquiries, which are the subject of this paper, to give a sort of general account of the apparatus employed in the course of them, it being for the most part new, and so constructed as to insure as far as possible much precision, leaving more minute details to the accompanying drawings.

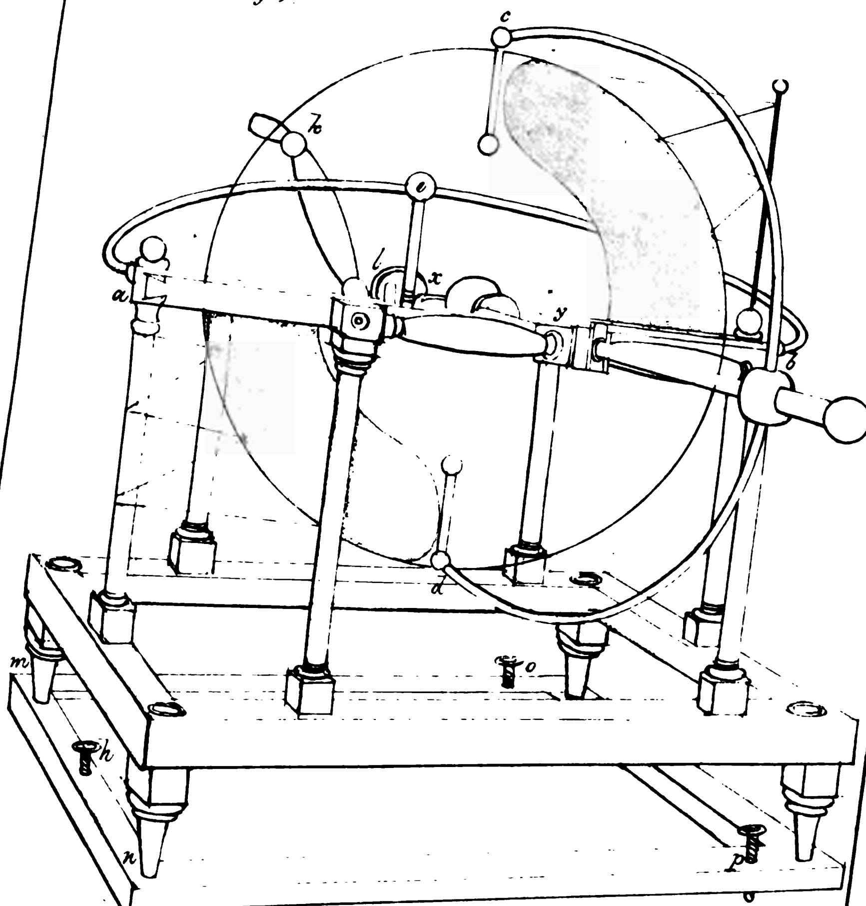
2. The electrical machine, fig. 1, consists of a circular plate of glass, three feet in diameter, mounted on an axis, between two horizontal supporters of mahogany; these are sustained by four vertical columns, of the same wood, fixed on a firm base. The rubbers are insulated on pillars of glass, (*a*) (*b*) and are placed at each extremity of a horizontal diameter of the plate. The positive conductor (*c b d*) projects in a vertical position, in front of the plate; whilst the negative conductor (*a e b*) passes in a curvilinear direction behind it and connects the rubbers of each side. The whole machine is sustained by four short legs, (*m n o p*) on a steady frame, (*n o*) furnished with rollers; and also with three levelling screws, (*h o p*) so that it may be easily moved into any required position; and may be eventually so adjusted and fixed, that the axis of the plate, which has free motion backwards and forwards in the holes, in which it turns, may not tend more to one side than the other, and produce an unequal action on the rubbers.

The plate is turned by means of an insulated handle, immediately in front of which, there is a short index, fixed in the axis, which travels over a divided circle, (*l*) attached to the horizontal part of the frame, and through the centre of which the axis passes; thus, the number of revolutions of the plate may be accurately estimated.

The centre of the plate, is strengthened by two smaller plates of glass, cemented to each side by varnish; and there is a small stop inserted into the axis, to prevent the pressure from increasing beyond a certain point.

The conductors, when the machine is employed to accumu-

Fig 1



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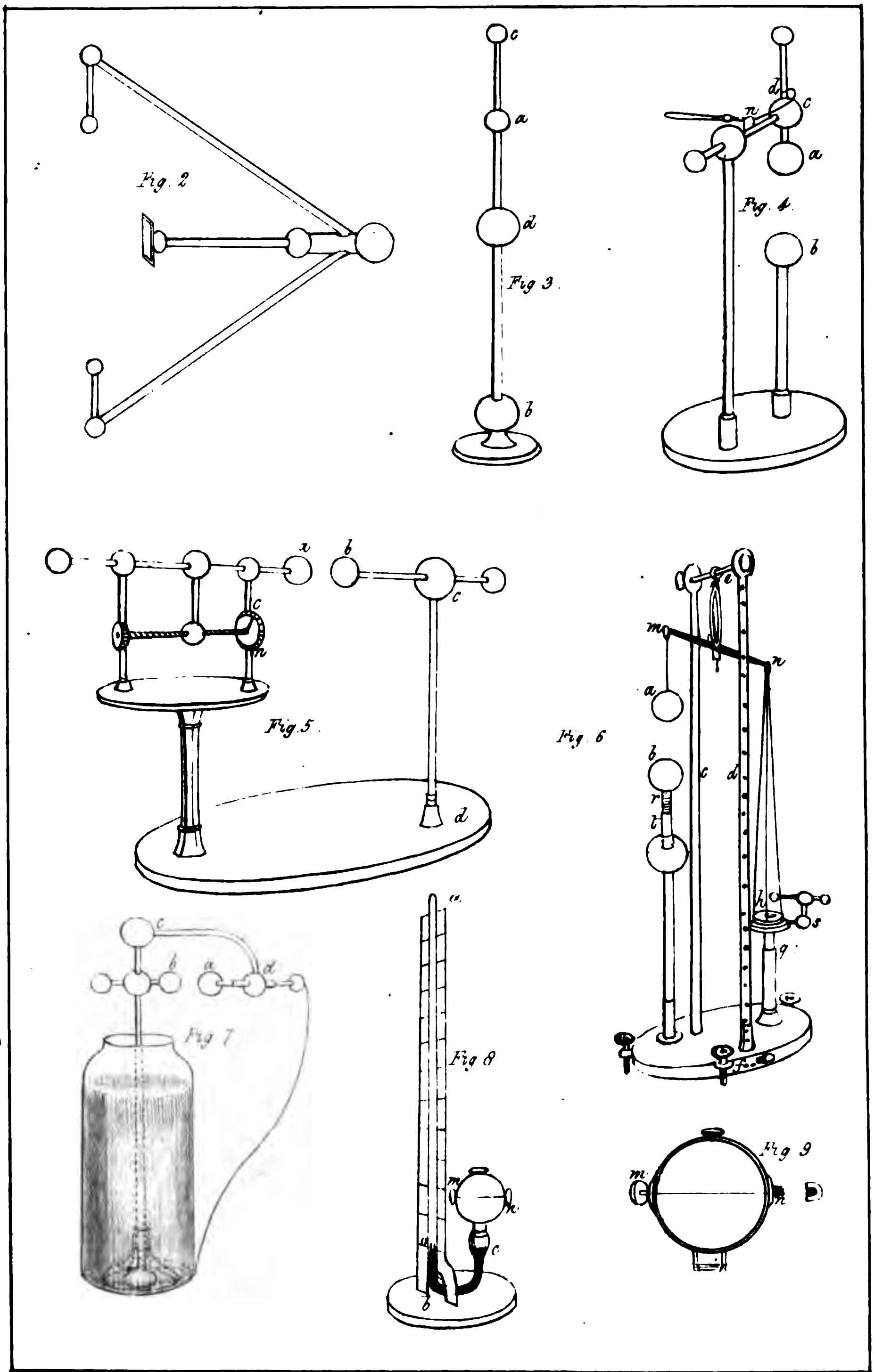

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late a charge, are of as small an extent as possible, and are covered, except at the receiving points, with sealing wax. The positive conductor being in this case constructed of small straight tubes, as represented in *fig.* 2; and its extremities terminate in balls of varnished wood, through the substance of which the necessary metallic communications pass.*

3. The requisite accumulation is obtained by means of coated jars, which are employed either detached or collectively; they are not furnished with covers, but the charge is conveyed directly to the bottom of each jar, by means of copper tubes, three-eights of an inch in diameter; these terminate above in balls of baked wood, and are supported below by a convenient foot, firmly cemented to the bottom of the jar; which is previously covered with a circle of pasted paper, leaving a central portion of the coating free, for the perfect contact of the charging rod, which passes through the center of the foot, as indicated by the dotted lines in *fig.* 7.

These jars, when employed either separately or collectively, are placed on a conducting base, sustained by short columns of glass, or some other insulating substance, so that the whole

* This machine was constructed in the year 1824; I had previously seen one on a similar principle, by Mr. Eagland, a Surgical Mechanician of considerable ability, residing in Poland-street, London. In Mr. Eagland's machine, the same frame which sustains the plate also carries the rubbers in the usual away, but it is thrown into a horizontal position, the whole being insulated and supported by four long glass columns. The negative conductor passes in front under one of the arms of the positive conductor.

Mr. Eagland's machine has very great power, and is an immense improvement on those of the ordinary kind. The great advantage obtained by the present arrangement, is stability; the requisite insulating pillars being relieved from the weight and straining of the framed plate, when in action: the conductors are advantageously placed, and the axis of the plate can be accurately adjusted, which is of great importance in obtaining a steady and equal excitation. The whole arrangement will be found very desirable and extremely convenient in practice.

can be insulated when required;* and for the purpose of allowing them to be charged and discharged with precision; they are connected with what may be considered as two centres of action;—the first of these consists of a brass ball, (*a*, *figs.* 3. 14. 16) which slides with friction on a metallic rod, (*c d*) so as to admit of its being adjusted to any required altitude; it it has a number of small holes, drilled in its circumference for receiving the points of the connecting rods of the jars—The rod which sustains this ball, is either insulated on a separate foot, and connected with the conductor of the machine, as in *fig.* 16; or is otherwise inserted directly into it, as in *fig.* 14. The second centre, consists of a larger ball of metal, (*b*) attached to a firm foot, and placed on the same conducting base with the jars, so as to have a perfect connection with it. The wire (*n b fig.* 14) employed to transmit the explosion, terminates in this ball.

When it is required to give the first centre of action (*a*) *fig.* 3. a separate insulation, the insulating rod of glass, is screwed immediately into the lower ball; (*b*) and sustains the metallic rod above described, by the intervention of a ball of baked wood, (*d*) as seen in *figs.* 3 and 16; the opposite extremity of the rod terminates in a similar ball, (*c*) through the substance of which, the conducting communication with the machine passes when it is placed on a separate foot. All the metallic connections are covered with sealing wax, except at the points of junction; and the wood balls and different insulations are carefully varnished.

4. To transmit the explosion at any required period, two different methods were employed, according to the circumstances of the experiment—In the first, the discharge is effected by means of the instrument represented in *fig.* 4. There are two balls of brass (*a*) (*b*) placed one over the

* Rosin or brimstone answers very well for this purpose; the latter is easily moulded to any convenient form, by pouring it in a state of fusion into common drinking glasses.

other about three inches apart—The lower one, (*b*) is insulated and is connected with the positive side of the jar or battery; and the upper one, (*a*) with the negative side through the centres of action before described. (3) The ball (*a fig.* 4) connected with the negative centre, is attached to a rod of brass, (*d*) which falls freely through a smaller ball, (*c*) when allowed to do so. It is preserved at a given distance by a curved and finely pointed brass wire, (*n c d*) inserted into it; this wire being moveable about a centre (at *n*) can, by means of a glass handle, be readily disengaged; and thus the upper ball (*a*) is allowed to descend on the ball beneath it, by which the accumulation is always transmitted in a certain and invariable way, and without leaving any residuum in the battery.

5. In the second method, the charge is allowed to proceed until it can break through a known interval; to measure which, a discharging electrometer is employed, *fig.* 5 on the principle first proposed by Mr. Lane, and described in vol. 51 of the Transactions of the Royal Society—the interval between the balls (*a* and *b*) being adjusted by a screw and index, the motion of which last is shewn by a graduated circle; (*c n*) thus the interval may be regulated with very great precision: the connexion with the opposite sides of the jar are made through the two centres of action, as in the preceeding case.

This discharging electrometer is also occasionally used in its more ordinary and simple form, as represented in *fig.* 7; the only difference being that the insulating portion (*c d*) terminates in balls of varnished wood, one of which (*c*) sustains it, whilst the other (*d*) contains the tube, through which the graduated metallic slide passes: there is likewise an additional ball, (*b*) placed in the charging rod, from which the jar discharges itself.

6. For the purpose of investigating the operation of the attractive force of the accumulation, and the law of its action under different conditions, I availed myself of a delicate and accurate balance, in the following manner:—

The beam (*m n fig.* 6) is sustained in the required position, between two vertical rods of glass; (*c*) (*d*) a covered wire indicated by the dotted line, (*e f*) passes through one of these and connects it with the negative coating. From one of the arms, (*m*) a hollow gilded ball of wood, (*a*) is suspended by a metallic thread; this ball is about two inches in diameter, and weighs about 160 grains. From the opposite arm, is suspended a light brass pan, (*p*) by means of silk lines in the usual way—in this pan, is placed as much additional weight as is requisite to balance the ball just mentioned; and to put the whole mass in a state of equilibrium. The attractive force of the accumulation, is caused to act directly on the suspended ball (*a*) by means of an insulated ball of brass, (*b*) of the same dimensions, which is fixed directly under it, and is connected with the positive coating: it is so placed, that it can be depressed from contact with the suspended ball, through given distances, by means of a cylindrical slide, (*r*) to which it is attached, and a socket (*t*); the slide (*r*) has a scale engraved on it, divided into twentieths of an inch, and is supported on a glass pillar, by means of a varnished ball of baked wood, in which the socket is fixed, and through which the connection with the positive coating passes.

It will be immediately perceived, that in this arrangement the attractive force acts directly between the balls, (*a*) (*b*) and it can therefore be measured under any given condition, by weights, placed in the pan, (*p*) suspended from the opposite arm of the beam. The pan is allowed to rest on a small circular support, (*q*) the elevation of which can be changed so as to accommodate it to the horizontal position of the beam, and check any oscillation: there is also a small stop, (*s*) inserted into this stand, which projects over the pan, and prevents the further descent of the beam, after the equilibrium is destroyed; without which, the explosion would pass, and destroy the gilding of the ball.

7. Lastly, to measure the effect of a given accumulation, an electrometer was employed, represented by *fig.* 8: it is very simple in its construction, being little more than an air thermometer, having a metallic wire passed air tight through its bulb; it consists of a glass tube, (*a b c*) whose interior diameter is somewhat less than the tenth of an inch; one of its extremities is bent upwards and outwards for about two inches, and is united by welding to a glass cup, at (*c*) which is of a large diameter and contains some coloured spirit: the bulb (*m n*) is about three inches in diameter, and with its transverse wire above mentioned is screwed air tight upon this cup. The opposite leg of the tube is sustained by a graduated scale, (*a b*) fixed on a convenient base, (*b*) and the point at which the fluid rests is marked zero. When an electrical explosion is passed through the wire, the fluid will be observed to ascend along the scale. The method of fixing the wire is easy; two flanches of brass, (*m n*, *fig.* 9) with projecting screws and shoulders, are cemented in and over the holes drilled through the glass, the wire is passed directly through the bulb by means of corresponding holes in these flanches, and being gently put on the stretch, is secured by short metallic or wood pegs, by which it is slightly compressed and retained in its situation. When metallic pegs are used it is necessary to have a small longitudinal notch cut in them. Both the pegs and extremities of the wire project a little for the convenience of removal; and thus wires of various kinds, and of different diameters, may be easily substituted.* The whole is finally rendered air tight by means of small balls of brass, which are made flat at one extremity, and screwed on the projecting parts of the flanches, against a collar of leather as shewn in *fig.* 9.

* See Transactions of the Royal Society, for 1827, pt. i. p. 18.

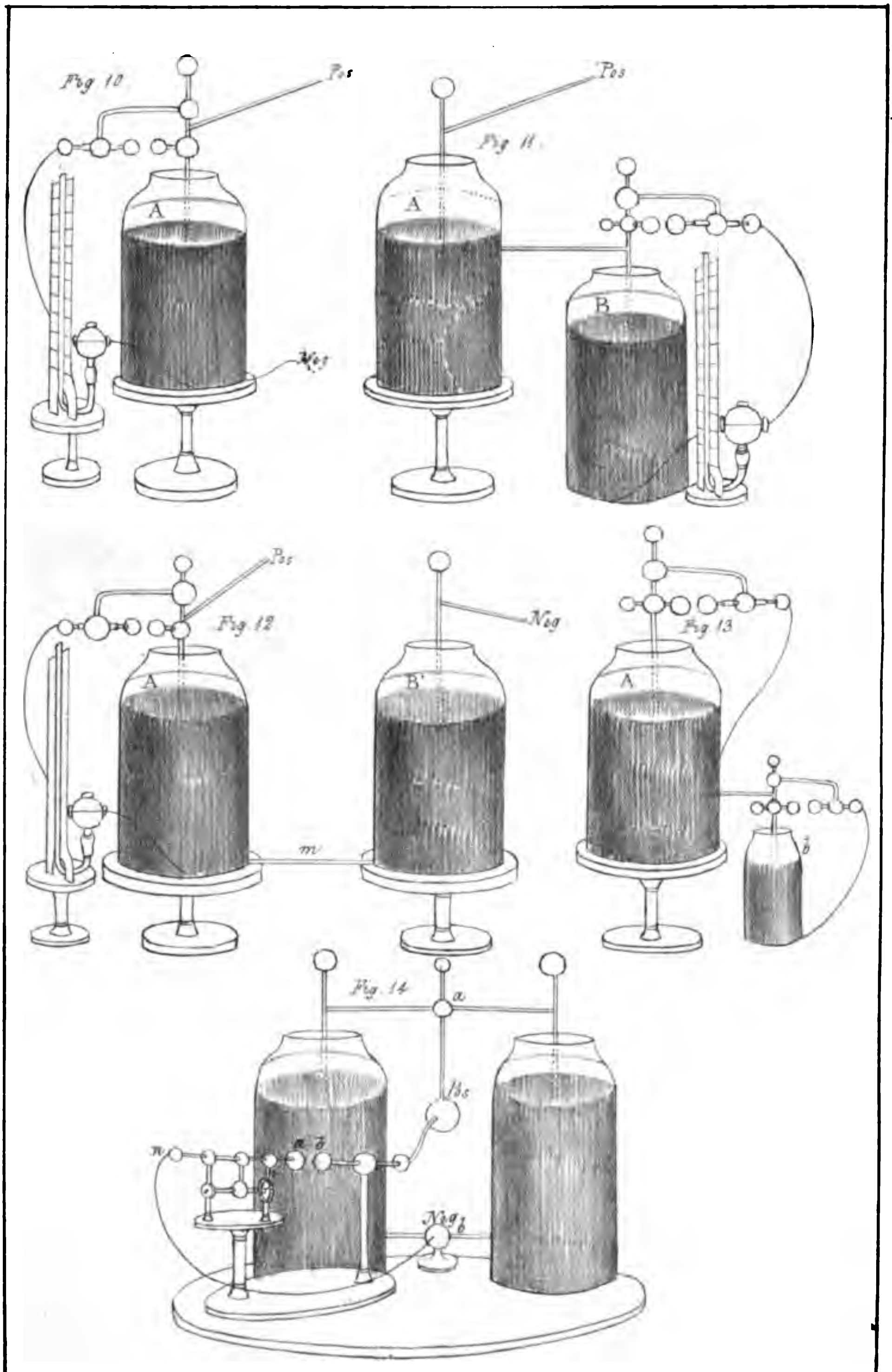
The metal best suited for measuring the force of an explosion in this way, is platinum; it is easily acted on, and not liable to oxidation. The wire may vary in diameter, between the 50th and 150th of an inch, according to the circumstances of the experiment. This method of estimating the effects of electrical explosions by their action on metals, will be found very convenient, and it is susceptible of much greater accuracy than the ordinary means by the fusion of metallic wire, which appears to be somewhat uncertain and precarious, when reduced to practice. *

9. In the detail of these inquiries, concerning the laws of electrical accumulations, our attention will be directed;—1—to the quantity of matter accumulated. 2—to the intensity, or free action of the accumulation. 3—to the extent and disposition of the surface, on which the matter has been distributed. 4—to the effects of the explosion: the quantity of matter, the surface and the intensity, being varied according to certain conditions. †

10. The relative quantity of matter may be measured by the revolutions of the electrical machine, employed to produce the accumulation; for if one revolution produces one quantity, as it assuredly does, then two revolutions should produce double that quantity, and so on, supposing the machine to be in good and uniform action, during the given time; but the precise manner in which a charge thus accumulates, not having been clearly determined, it is necessary to demonstrate, by

* Cuthbertson's Practical Electricity, p. 186.

† The immediate cause of electrical phænomena, must be considered as an agent of a peculiar kind, and if material, differing essentially from the usual forms of matter. The hypothesis of materiality, has only been assumed that we may be the better enabled to connect the results of experiment, and reason on them;—the only legitimate end for which hypothesis is at all admissible; whether electrical agency be material, or no in the ordinary acceptation of the word, I do not presume to determine.



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experiment, that an artificial electrical accumulation, on a coated surfaee, may be supposed to proceed, by equal increments.

There are however, a few previous experiments, requisite to be detailed, because they seem to constitute the basis on which the above conclusion rests. *

Exp. 1. (*fig.* 10) A jar, (A) containing five square feet of coated surface, being insulated; its inner coating was connected with the positive conductor, and its outer coating with the negative conductor. The discharging electrometer, *fig.* 7, was attached to the jar, and the distance between the balls, set to an interval of three-tenths of an inch. In order to estimate the effects of the explosion, the negative ball was connected with the outer coating, through the electrometer, before described; (*fig.* 8) which last, was also carefully insulated. When three turns and three quarters of the plate were completed, the explosion took place, between the balls, and passing through the wire, elevated the fluid, nine degrees of the scale.

Exp. 2. The outer coating of the jar, being connected with the ground instead of with the negative conductor, the same result was obtained; the fluid was again elevated nine degrees, and with the same number of turns of the plate.

Exp. 3. The outer coating of the jar, (A) being joined

* It may not be improper to state, that in the course of these inquiries, it has been thought desirable to submit to a rigorous examination, some few phænomena, in the science of electricity, already known, but which, nevertheless, do not appear to have undergone a very severe scrutiny, by experiment; not only because this constituted a necessary step in the investigation, but because it seemed more satisfactory to apply the same method of demonstration to facts which have been admitted, as was resorted to for the purpose of farther research.

to the inner coating of a second and perfectly similar jar,* (B) and the connection with the negative conductor, or with the ground, completed through the outer coating of this last, the machine was again put in action.—The explosion again passed at the end of the same number of turns, and again elevated the fluid nine degrees. This arrangement is represented in *fig.* 11; except, that the electrometers must be supposed to remain with the insulated jar, as seen in *fig.* 10.

Exp. 4. (*fig.* 11) The matter which had accumulated in the second jar, (B) from the outer coating of the first jar, (A) being discharged; the electrometers, were transferred to this last, in order to ascertain if the accumulation in (B) was precisely similar to that which took place in the first jar (A). The machine being put in action, the explosion again passed at the end of the same number of turns, and again elevated the fluid, nine degrees as before.

Exp. 5. (*fig.* 12) The electrometers, being again transferred to the jar, (A) as in exp. 1. *fig.* 10; the second jar, (B) was also insulated, and its inner coating connected with the negative conductor; the outer coatings of the two jars being joined by a metallic rod (m). Under these circumstances, the explosion again occured, at the end of the same number of turns, and with the same effect as before.

Exp. 6. Lastly, the electrometers being transferred to the jar, (B) charged from the negative conductor; the machine was again put in action: the discharge again passed as in the preceding cases, and again raised the fluid nine degrees of the scale. I repeated these experiments with jars,

* By a perfectly similar jar, is to be understood, a jar which will explode over a given interval with the same number of revolutions of the plate, and cause the fluid to ascend along the scale of the electrometer, *fig.* 8, the same number of degrees.

not precisely similar; by alternating them, and taking the mean results, and arrived at the same conclusions.

11. We may therefore infer: 1—that precisely the same charge accumulates on a coated surface; whether we suppose the opposite coating to be insulated and connected with one of the conductors of the machine, or whether it be in a freely uninsulated state, or otherwise, whether it operate through an intervening jar. 2—that the charge conveyed to an intervening and similar jar, is precisely equal to the charge conveyed to the first jar, in connexion with the conductor of the machine.

12. These experiments being premised, we pass on to the more immediate object of this part of the inquiry. (10)

Exp. 7. The jars and electrometers being arranged, as in *fig.* 11; the explosion again passed at somewhat less than four turns of the plate, and again raised the fluid nine degrees, as in exp. 4. The small residuum in the jar, (B) being discharged, the machine was again put in action;—the first jar, (A) connected with the conductor, remaining charged with the previous accumulation; when the same number of turns had been completed, the jar (B) discharged again, and with precisely the same effect on the wire as before.

Exp. 8. (fig. 13) A small jar, (*b*) containing about a square foot, and two-tenths, of coated surface, being substituted for the jar (B), the explosion took place, at about each turn of the plate, until the jar (A) became fully charged. Now in these instances, the jars, (B,) (*b*) being charged from the outer coating of the insulated jar, (A) their explosions became a fair measure of the relative quantities of matter, communicated by the machine. (Exp. 3 and 4) and as these explosions correspond in each case to equal numbers of revolutions, whilst the receiving jar, (A) was charging in any degree short of saturation, it follows, that the accumulation in (A,) must have proceeded by equal increments; and consequently, that equal quantities of matter were thrown on at each turn.

Exp. 9. In order to ascertain if these explosions would take place in a similar way, when two or more jars, were substituted for the jar (A.) The experiment was arranged, as represented in fig. 16; the jars and electrometers being carefully insulated—the result however remained the same; the small jar discharged as before, and in precisely the same way. The explosions of a second jar, therefore, in connexion with the opposite coating of a charging surface, whether in a divided or undivided state, may be also considered as a fair measure of the relative quantities of matter accumulated.

Exp. 10. (fig. 12). Two equal and similar jars, (A) (B) were insulated, and connected, one with the negative, and the other with the positive conductor, as in exp. 5;—the outer coatings being joined by a metallic rod (m). In this case, as much matter as was conveyed into the positive jar, (A) was evidently taken from the negative jar, (B) and reciprocally. The effects of the accumulation in either system, estimated as before, at given intervals, were precisely the same, and corresponded to an equal number of turns of the plate: consequently, the respective quantities which continued to accumulate in the opposite system after each discharge, must have been also precisely similar.

13. These experiments relate to quantity; and they evidently shew: 1—that equal quantities are given off at each revolution of the plate, (if in a state of uniform action,) whether *to an uncharged surface, or to a surface charged in any degree short of saturation.* 2—that a coated surface, charging in any degree short of saturation, receives equal quantities, in equal times; all other things remaining the

same—whence, it may be inferred, that the number of revolutions of the electrical machine is, under the above condition, a fair measure of the relative quantity of matter. 3—That the explosions of a jar, charging from one of the coatings, are proportional to the quantity of matter thrown upon the other.—The quantity of matter may therefore be easily estimated by the number of these explosions.

14. Having determined these laws, relating to the quantity of matter accumulated, we come now to the consideration of the free action, or intensity, it evinces, under various circumstances.

When a given accumulation is disposed on a simple insulated conductor, it endeavours to fly off and discharge itself upon any body which happens to be within the sphere of its action: but if the surface of the insulated conductor on which the matter is accumulated be increased, then the tendency to discharge is lessened. To express this tendency of the accumulation to pass off in any given direction, the term intensity has been employed. Intensity therefore is but another term for what may be called free action.

But experience has shewn, that it is possible to controul the free action of a given quantity of electricity, not only by disposing it on a more extended surface, but also by opposing to the insulated conductor, a second conductor of equal and similar extent; the latter being in a freely uninsulated state, placed parallel and near to the former (fig. 19,) and the two conducting surfaces separated by some perfectly insulating medium. By this peculiar arrangement, the accumulation appears to be so determined upon the uninsulated surface, that the tendency to discharge in any other direction is diminished: the free action will therefore be more or less controlled, in some ratio of the distances of the opposed conductors.

There is however this difference in the actual condition of the two arrangements—when the matter is disposed and retained on a continuous surface, the whole of that surface is supposed to be in the same electrical state; whereas, in the latter instance, half the surface only is in a similar state; the opposed uninsulated portion being in an opposite one; this seems to be a necessary consequence of the subsequent action; and without such effect can ensue, the attractive force between the opposed conductors is not found to be so exclusive:—hence, it would seem, that, by means of the increased capacity of the uninsulated conductor, a given accumulation can be retained in this way, even with greater facility than on an extended and continuous surface.

It will be immediately perceived, that the Leyden jar is merely an arrangement of the above description; since one of its coatings is perfectly insulated, and placed near and parallel to the other; the latter being in a freely uninsulated state, and the two coatings separated by an insulating and resisting medium.

15. If therefore two conductors (*a*)(*b*) (figs. 5 6 7) be separated by a given interval, and be connected with the insulated and uninsulated coatings, as in figs. 7, 14, 15, then the free action may be estimated by means of these conductors; 1—by measuring the interval between them, which it can break through. 2—by measuring its attractive force or tendency to discharge, both of which will increase in some direct ratio of the quantity of matter, and in some inverse ratio of the controlling power of the uninsulated coating; all other things remaining the same.

16. The former of these methods will be first considered: and for which purpose we shall refer to the exploding electrometers above described, (5) and represented figs. 5 and 7.

Exp. 10. Two similar jars, each containing five square feet of surface, being connected with the discharging electrometer, (fig. 5) and with the positive conductor as represented in fig. 14. and the interval between the balls adjusted to one-tenth of an inch, the discharge took place at the end of two turns and half of the plate. The interval between the balls being now doubled, and the small residuum in the jars neutralised, the discharge passed when five turns were completed. The interval being increased to three-tenths of an inch, or treble the first distance, and the residuum discharged as before; the explosion passed at the end of seven turns and half of the plate. On increasing the interval to four-tenths of an inch, the discharge took place at the end of ten turns.

Exp. 11. One of the jars in the former experiment being removed, and the interval between the balls adjusted to four-tenths of an inch, the discharge took place with five turns of the plate. The quantity of coated surface being now doubled by adding a second and similar jar, and the interval between the balls diminished to two-tenths of an inch, the discharge again took place at the end of five turns. The quantity of coated surface being again doubled by adding two more equal and similar jars, and the interval between the balls reduced to one-tenth of an inch, or to a quarter part of the first distance, the discharge again occurred at the end of five turns of the plate.

Exp. 12. A single jar being connected as before, and the interval between the balls adjusted to two-tenths of an inch, the discharge occurred at the end of two turns and half. A second similar jar being added, the discharge occurred with five turns of the plate. A third similar jar being added, seven turns and half were required to complete the discharge: the interval between the balls remaining in each case the same.

Exp. 13. Two similar jars being connected with the conductor, and the interval between the balls adjusted to two-tenths of an inch, the discharge took place with five turns of the place. One of the jars, that is half the surface, being removed, and the interval between the balls quadrupled, the discharge occurred with ten turns of the plate, or double the former.

These results as far as I could ascertain, did not appear to be influenced by the way in which the surface was disposed; thus whether the extent of surface was made up with separate jars, or otherwise consisted of one large jar, still the same results were obtained, provided the areas of the coatings were accurately adjusted, and that the thickness of the glass did not vary.*

17. We may therefore conclude, that the free action of an electrical accumulation, as estimated by the interval it can break through, is directly proportional to the quantity of matter; (exp. 10) and inversely proportional to the surface, (exp. 11.) If therefore we increase the matter and the surface in the same ratio, the interval remains the same; (exp. 12)—and if we represent the quantity of matter by Q, the interval by I, and the surface by S, we obtain by exps. 10 and 11, the following expression $I \propto \frac{Q}{S}$ from which we get $Q \propto S\,I$; and thus derive another means of estimating the relative quantity of matter thrown upon a given surface, supposing the surface to be either in a divided or undivided state, and all other things remaining the same. Hence, if the surface be constant, the quantity accumulated is as the interval; and if the interval be constant, it is as the surface; and if as Q be increased, S be decreased, then we have $I \propto Q^2$.

* It will be necessary to keep in mind, that this relates only to the free action, and is not to be assimilated with the effects of the explosion on metals under similar conditions. (24.)

I repeated the above experiments, by insulating the jars and electrometer on the principle represented in figs. 13 and 16, so as to measure the quantity of matter by means of the explosions of a jar, charging from the outer coatings; (exp. 9,) and it is not difficult to obtain in this arrangement, such a distance between the balls of the exploding jar, (*b* fig. 13) as will accurately measure the accumulation corresponding to a given explosion of the jar (A) in which the accumulation has taken place: and thus by varying the distance between the balls of the electrometer connected with the jar A, whilst the electrometer attached to the jar *b*, is preserved the same; we may investigate the free action as before.

18. We now come to consider the second method of investigating the law of free action, as regards the attractive force or tendency to discharge.

In the application of the instrument described (6) (fig. 6) to this purpose, it is desirable, when the distances between the conductors (*a*) (*b*) require to be varied, that the opposed surfaces should be plane and parallel, (fig. 20) so that the distance between the attracting points may be every where equal; or otherwise, in employing equal spheres, it will be essential to determine, in each opposed hemisphere, a fixed point, as *a* and *b*, figs. 24 25, from which the sum of all the attractions would produce the same effect as if those attractions were exerted from every point of the hemispheres: so that when the distance between the balls is varied, the interval may be reckoned between these points, and not from the immediate point of contact.* This point will be found to fall

* We suppose here the forces to act in parallel lines, which appears to be an essential condition of this species of attraction; since the opposed surfaces being in equally opposite states of electricity, the reciprocal influence of the nearest points must be such as to neutralize each others' action, in relation to any other point more distant: the attractive forces therefore between these points becomes exclusive, and consequently, the lines of attraction are parallel. fig. 24.

within the opposed hemispheres at a distance equal to one-fifth of the radius. *

19. It may be observed, that in the application of an exploding electrometer, (fig. 5) this process is not requisite: since the explosion always passes from the nearest points, and no other; the attractive forces from the other parts of the balls do not consequently interfere with the accuracy of the result; more especially as the balls are fixed at a given interval, and cannot therefore approximate; this is essentially distinct from the case in which we seek to measure the attractive force, by opposing to it a known weight, the spheres being moveable, since in the last case, we cannot separate the attraction of one point from the whole, and must therefore take the whole into the account.

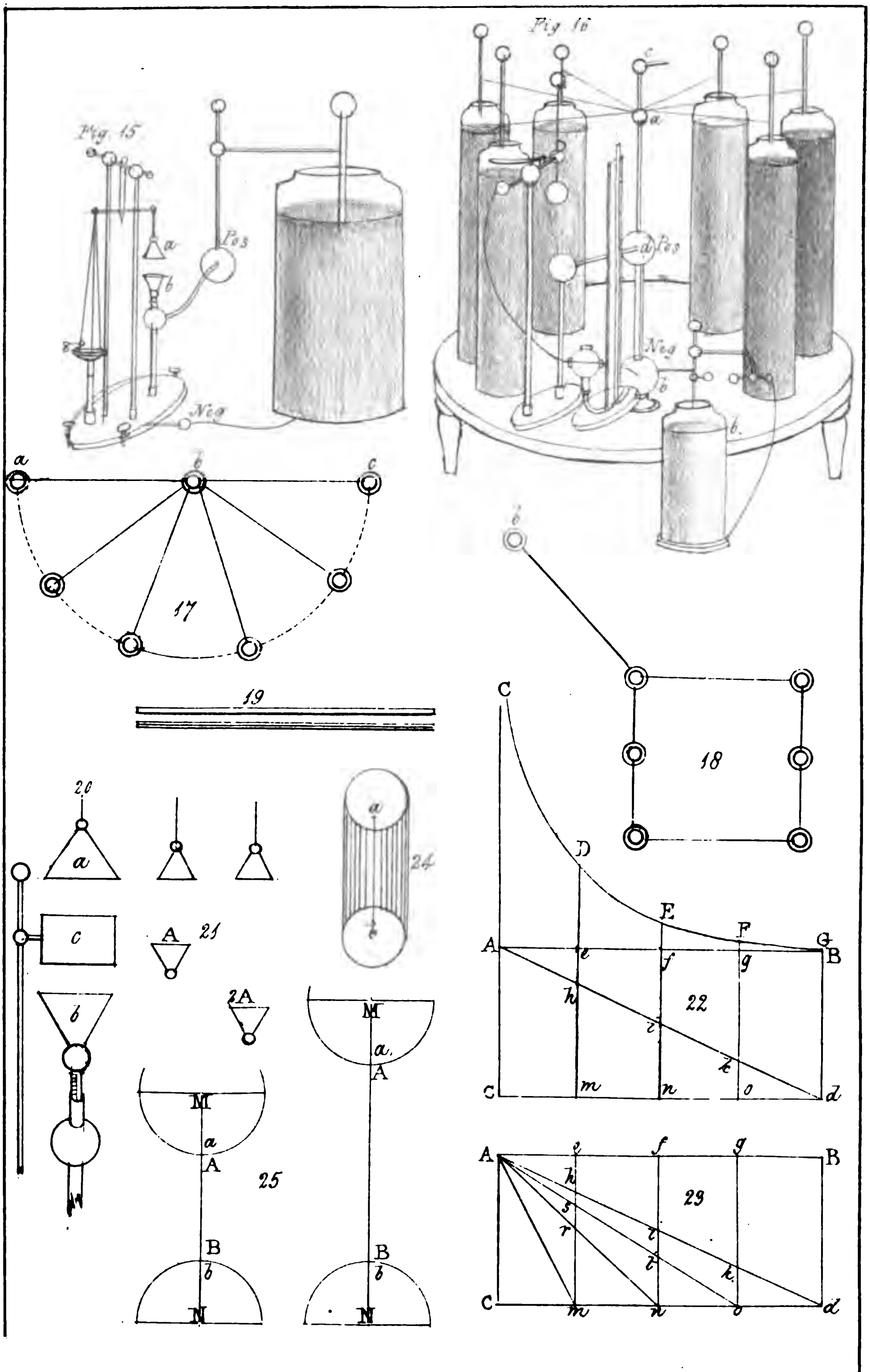
* Let M and N (fig. 25) be two hemispheres, whose diameters are two inches, and attracting each other at the distances A B $A_, B_,$ Let $a\,A = B\,b = a_, A_, = B_, b_, = x$ let A B = ,5 of an inch, and $A_, B_, = 1.4$; at which distances the respective attractive forces were found, by experiment, to be as 16 : 4 or 4 : 1.

Then $4 : 1 :: (a_, b_,)^2 : (a\,b)^2 :: (1{,}4 + 2\,x)^2 : ({,}5 + 2\,x)^2$

$\therefore 4 \times (.5 + 2x\;) = (1.4 + 2x)^2$ from which we obtain

$$x^2 + \tfrac{9}{10}\,x = {,}08$$

By solving this equation we shall have $x = +.3 - .1$, and consequently $x = +.2$ of an inch, or a distance equal to one-fifth of the radius; the other value of x being negative, and therefore in this case an impossible quantity. This expression will be found to be true for any two equal spheres; thus, in spheres of three inches diameter, the attractive forces were found, by experiment, to be as 4 : 1, when the respective distances A B $A_, B_,$ were 0.5 and 1.6. In spheres of 1 inch diameter, they were as 4 : 1 when A B $A_, B_,$ were 0.5 and 1.2. By substituting these quantities, in the above equation we shall have as before, x equal to one-fifth of the radius of the respective spheres. It may be further remarked, that the same results as in experiment 14 were obtained, when the opposed conductors were equal spheres, and the intervals estimated from within each hemisphere, at a distance equal to one-fifth of the radius.



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Exp. 14. A single jar, containing five square feet, being connected with the instrument already described; (6) and the connection with the negative coating completed, as represented in fig. 15, the insulated conductor *b* was depressed from contact with the suspended conductor (*a*) through an interval of half an inch, and a weight of sixteen grains placed in the small pan suspended from the opposite arm of the balance.* When five turns of the plate were completed, the attractive force was sufficient to tip the beam. The accumulation being discharged, the insulated conductor (*b*) was depressed through a second interval of half an inch, making the whole distance one inch. A weight of four grains or ¼ part of the former weight being now placed in the pan, the beam was again depressed with five turns of the plate: so that the distances being as 2 to 1, the corresponding weights were as 4 : 1. The accumulation being discharged, and the insulated conductor (*b*) depressed through a third interval of half an inch, and one-ninth part of the first weight placed in the pan; the beam was again depressed with five revolutions of the plate. We may therefore infer, *that the attractive force between the conductors varied in an inverse ratio of the square of the distance of the points of contact.*

Exp. 15. The distance between the conductors being adjusted to an interval of an inch, and a weight of four grains placed in the pan; the beam was again depressed with *five* revolutions of the plate. The quantity of matter being now doubled, that is to say, *ten* turns of the plate being allowed to accumulate, sixteen grains werc requisite to balance the attractive force: the attractive force therefore, all other things remaining the same, increases directly as the square of the quantity of matter accumulated. This became further evident by placing a weight of thirty-six grains in the pan: in which case the beam was depressed with about fifteen turns of the plate.

* The position of the suspended conductor (*a*) is carefully adjusted by means of the three levelling screws attached to the base of the instrument, so that it may hang vertically and parallel over the insulated conductor (b).

20. This result is a necessary consequence of the law which seems to govern all these forces; for let two balls be connected with the opposed surfaces, and be separated by any given interval, and let the accumulation proceed until the free action can pass this interval: call the quantity at the time of the explosion 1, and the attractive force at the same instant also 1, and let the number of revolutions of the plate necessary to produce the accumulation be expressed by n. If we suppose the interval to be doubled, then the attractive force, all other things remaining the same, will be reduced to $\frac{1}{4}$, since the force varies in an inverse ratio of the square of the distance between the exploding points (exp. 14)—the discharge therefore, with the same quantity of matter, cannot occur at this new interval; but we have seen (by exp. 10) that with $2\,n$ turns of the machine, that is with double the matter, the explosion will again pass at a double interval. If therefore, when the interval between the balls is doubled, we double the matter, the discharge will again take place; but in this case, the attractive force must necessarily be as great at the greater interval, as it was at the lesser interval, without which the explosion could not happen, that is to say, it must have increased from $\frac{1}{4}$ to 1; or if measured at the first interval, it must be equal to 4; in either case, with double the quantity of matter, it must be four times as great, all other things remaining the same.

Exp. 16. A weight of 16 grains being placed in the pan, add the interval between the balls again adjusted to an inch, the beam was again depressed with 10 revolutions of the plate: a second equal aad similar jar being added, that is to say the surface being doubled, ten revolutions of the plate were still requisite to depress the beam, when only four grains were placed in the pan: thus it may be perceived, that the same matter, disposed on a double surface only, evinces $\frac{1}{4}$ part of the free action: the distance between the balls being constant. I repeated these experiments, the apparatus being insulated, and the quantity of matter measured by the explosions of a small jar, charging from the outer coating, as already explained, (exps. 8, 9,) and obtained the same results; the interval between the balls of the exploding jar, being made very small.

21. We may therefore conclude, 1—that the attractive force varies in an inverse ratio of the square of the distance; all other things remaining the same. 2—if the surface be constant, and the matter increased, the attractive force is directly as the square of the quantity of matter. 3—if the matter be constant, and the surface increased, the attractive force is in an inverse ratio of the square of the surface. 4—if both the surface and the matter be increased in the same proportion, the attractive force is constant; and if we represent the attractive force by A, the quantity of matter by Q, and the surface by S, we have (exps. 15, 16) the following expression: $A \propto \frac{Q^2}{S^2}$ from which we deduce $Q \propto \sqrt{AS^2}$ or $Q \propto S\sqrt{A}$ and thus derive other expressions for estimating the relative quantity of matter; hence if the attractive force be constant, the quantity of matter is as the surface; and if the surface be constant, it is as the square root of the attraction; and if, as Q be increased, S be decreased, then we have $A \propto Q^4$

The want of a correct knowledge of these laws, has I apprehend, occasioned much uncertainty, in the results of many electrical inquiries. Thus in employing the well known and ingenious balance, or steel-yard electrometer, of Mr. Cuthbertson, in which the force of the free action is opposed by a known weight; it has been assumed,* that when the slider has been set to 15 and 30, so as to measure separate charges, the surface being constant, that the corresponding

* Cuthbertson's Practical Electricity, p. 175, 178, 179, 180.

accumulations, are in the same ratio, that is to say, as 2 : 1; whereas, in order to obtain a double accumulation, the slider should be set to sixty grains, instead of thirty; since the opposing forces should be to each other as 4 : 1.

22. Having determined the relations which subsist between the quantity of matter. and the free action of a charged surface, and shewn how these last may be measured; we come now to investigate the effects of the explosion: the quantities we have been considering being varied, according to certain conditions.

Exp. 17. (*fig.* 10) A single jar, containing two square feet and half of coated surface, being connected with the conductors, and with the electrometers before mentioned, (5) (7) and the distance between the balls adjusted to eight-tenths of an inch, the explosion took place with five revolutions of the plate, and elevated the fluid eighteen degrees.

Exp. 18. A jar, containing five square feet, or double the former surface, being substituted for the jar in the last experiment, and the distance between the balls adjusted to four-tenths of an inch, the explosion again passed with five revolutions of the plate, and again elevated the fluid eighteen degrees.

Exp. 19. A second equal and similar jar, being connected so as to double the last surface, and the distance between the balls diminished to two-tenths of an inch, the discharge again passed with five revolutions of the plate, but only elevated the fluid to twelve degrees, or about two-thirds of the former.

Exp. 20. The two larger jars being removed, and two jars containing each two square feet and half substituted, that is to say, half the former surface, divided into two equal and similar parts, and the interval between the balls again increased to four-tenths of an inch, the explosion again passed with five revolutions of the plate, and again elevated the fluid twelve degrees.

Exp. 21. A series of six jars being selected, differing in thickness, and the areas of whose coatings varied from one to five square feet; each jar was connected in succession with the conductor and electrometers, and two turns of the plate thrown on it: the discharge being effected by means of the discharging electrometer; (*fig.* 4) the fluid was in each case elevated to eighteen degrees. *

I repeated these experiments, by insulating the apparatus; the quantity of matter being measured by the explosions of a jar, charged from the outer coating, (as in *fig.* 16;) and the discharge effected as in the last experiment, and obtained the same results. We may therefore conclude, 1—that the effect of the explosion depends exclusively on the quantity of matter, without reference to the free action; (exps. 17, 18, 21.) and, 2—that in disposing the same quantity of matter, on the same surface, divided into two equal and similar parts, about one third of its effect is lost. (exps. 19, 20.)

23. Exp. 22. A single jar containing five square feet, being connected as before, (*fig.* 10) and the distance between the balls adjusted to two-tenths of an inch, the explosion passed with two revolutions and half of the plate, and raised the fluid four degrees and half of the scale. The small residuum being discharged, and the distance between the balls adjusted to four-tenths of an inch, the explosion passed at five revolutions of the plate, and raised the fluid eighteen degrees. The dis-

* In this last experiment, it was necessary to employ a much finer wire, than in the preceding cases, in order to render the effect more apparent; the quantity of matter being small.

tance between the balls being now adjusted to six-tenths of an inch, and the residuum neutralized as before, the discharge passed between the seventh and eighth revolution of the plate, and raised the fluid to about forty degrees.

The same results were obtained, by insulating the apparatus, and measuring the quantity of matter, by means of the explosions of a jar, connected with the outer coating. *It may therefore be inferred, that the effects of an electrical explosion on a metallic wire, all other things remaining the same; is directly as the square of the quantity of matter.*

This law did not appear to be influenced by disposing the accumulation on a divided surface; for although the magnitude of the corresponding effects was reduced, as in exp. 19, yet the surface being constant, the subsequent results were directly as the square of the quantity of matter.

24. Having thus found, (23) that the effect of the explosion on a metallic wire, is directly as the square of the quantity of matter: all other things remaing the same—and (exp. 19) that in disposing the same quantity of matter, on the same extent of coated surface, divided into two equal and similar parts, about one-third of its power is lost; it seems a point of some interest, to pursue this investigation a little further, in order to ascertain what subsequent decrements in the effect take place, by a still greater division of the surface; the quantity of matter remaining constant.

With this view, six jars were selected, each containing about a square foot, and four-tenths of coated surface: they did not materially differ in their electrical capacities; and since the investigation related exclusively to the quantity of matter and the surface, the excitation of the machine, was tested by an exploding jar, and the quantity of matter measured, both by means of the revolutions of the plate, and the explosions of a jar charged from the outer coatings; the discharge being effected by means of the discharging electrometer *fig.* 4. The general arrangement is represented in *fig.* 16.

Exp. 22. A single jar being connected with the conductor, and charged with two revolutions of the plate, the effect on the wire was observed and noted. A second jar was now examined in a similar way; the respective effects did not greatly vary, but the mean result amounted to just sixteen degrees. The two jars being now combined, and the same quantity of matter disposed on them, the resulting effect was only eleven degrees, the loss being about one third. This process was repeated, with the same quantity of matter disposed on three jars; the mean result of the three, taking each separately, being first determined, and then the result of their combination—in this case, the loss amounted to somewhat less than one half—a similar process with four jars, gave a loss rather greater than one half—with five jars, it amounted to nearly two-thirds, and with six jars to about four-fifths. The results are given in the following table.

TABLE I.

REVOLUTIONS OF THE PLATE.	NUMBER OF JARS.	EFFECT.
2	1	16
2	2	11
2	3	9
2	4	7
2	5	5
2	6	3

It might therefore be supposed, that by increasing the number of jars, the effect would at length be reduced to zero, and such was found to be the case; for on disposing the same matter on a great number of jars, the effect on the wire became insensible.

25. As a further extension of the preceding investigation, the quantity of matter was made to increase as the number of jars, and to obviate any error which might be supposed to arise from slight differences in the jars, each jar was first examined separately, and a mean result obtained; they were then combined in pairs, the matter being doubled, then each three jars were combined; the matter being tripled, and so on to the last combination, in which the whole six were combined; the matter being six times as great as in the first instance. The mean results of each respective series of combinations are given in the following table. *

TABLE II.

REVOLUTIONS OF THE PLATE.	NUMBER OF JARS.	EFFECT.
2	1	11
4	2	26
6	3	50
8	4	73
10	5	85

It is easy to reduce the above results, to the same form as in the preceding table, so as to obtain the relative effects of the same quantity of matter disposed on a given number of

* In these experiments, it became necessary to employ a larger wire in the electrometer, than in the preceding, in order to resist fusion; the quantity of matter being greatly increased.

jars; since the effect (23) is directly as the square of the quantity of matter. Thus to havè the effect of the matter disposed on two jars, as compared with the same quantity disposed on one, we divide the effect on two jars by four: to obtain the effect on three jars as compared with the same quantity on one, we divided the effect with three jars by nine, and so on. The results thus reduced are given in the following table; and it will be observed, that they do not considerably differ in their relation to each other, from those before obtained. (exp. 22.) Table I.

TABLE III.

REVOLUTIONS OF THE PLATE,	NUMBER OF JARS.	EFFECTS.
2	1	11, 0
2	2	6, 5
2	3	5, 5
2	4	4, 5
2	5	3, 4

26. In referring to table II, it may be observed, that when the quantity of matter and the number of jars are both increased together, the full effect of the respective accumulations is not obtained; since double the matter disposed on two jars, only equals about two and half times the first effect, instead of four times, which it shonld do if disposed on one. (23) By disposing three times the quantity of matter on three jars, we only obtain about four and half times the first effect, instead of 9 times, and so on, untill at last in increasing the number of jars, the differences in the respective effects become less and less, so that a limit appears to obtain, in which the advantage derived from an increased quantity of

matter, becomes neutralized by the opposite effect of the increased number of jars.

These results are very analogous to those arrived at in the extensive investigations of Mr. Children with his large voltaic battery, in which an intense deflagrating power was obtained by accumulating the electric action on as great an extent of undivided surface as possible;* and also with those of Sir H. Davy,† in which the relative powers of ignition with an extensive voltaic series appeared to decrease after a certain limit, beyond which there is a loss of power; which is precisely what happens when the number of jars and the quantity of matter are both increased together, and in the same proportion.

27. It may be proper to observe, that the above results are somewhat at variance with the conclusions arrived at, in Mr. Singer's excellent work on electricity; he infers, p. 179 that the same quantity of matter, will fuse the same length of wire, whether it be disposed on two jars, or on one: but it may be shewn, that in the immediate experiment from which this conclusion has been drawn, the quantity of matter greatly varied. In the experiment alluded to, eight inches of wire had been previously fused, by a single jar, charged to thirty grains; it was likewise fused by two jars, charged to fifteen grains,‡ and it is inferred, that the quantity of matter was in each case the same; whereas, in the latter instance, it must have been greatly increased, for it will be remembered, (15) (20) that by the expression charging a single jar, or otherwise, two jars to any degree, say fifteen or thirty grains, we thereby mean, that certain relative measures of the free action of the accumulation have been obtained, as indicated by its attractive force; the surface on which the matter is disposed

* Elements of Chemical Philosophy, p. 159. † Ib. p. 156.

‡ Exp. 77, page 177.

being given. Now it has been shewn, (exp. 16) that supposing the same quantity of matter to be disposed on a double surface, the intensity or free action, as indicated by its attractive force, would be reduced to one quarter; consequently, the intensity corresponding to the previous quantity of matter on the single jar, would when both jars were employed, only amount to seven grains and half; that is to say, to the one quarter part of thirty grains; the previous intensity on the single jar, supposing the jars to be precisely equal and similar. But in the experiment above-mentioned, the intensity on the double surface, was double this amount, or fifteen grains; therefore the matter accumulated, by a very simple calculation, must have been greater than in the previous case with the single jar by nearly one half; for the surface being constant, the quantity is directly as the square root of the attractive force. (21)

It is easy from the preceding investigations, to observe the relations which subsist between the interval which the free action can break through, the attractive force it exerts, and and the resulting effect of the explosion. For since $I \propto Q$ (18) and $A \propto Q^2$ (21) and $E \propto Q^2$ (23) the effect being represented by E; therefore the effect and the attractive force must vary together, and each must vary as the square of the interval—all other things remaining the same.

28. It has been my endeavour hitherto, in the course of these inquiries, to confine my observations as much as possible to matters of plain experimental evidence, in order that they might not be embarrassed by theoretical speculations, which would be a source of serious objection. I have therefore, avoided entering upon any explanation of the curious phænomena, that the interval which the free action of an electrical accumulation can pass, is directly as the quantity of matter accumulated; (exp. 10) whilst the attractive force is as the square of the quantity. (exp. 15.) I have only endeavoured

to shew, (20) * that these phænomena are perfectly consistent with each other, and involve no sort of contradiction. A few additional observations concerning these laws of electrical action, more especially as relating to the attractive force of the accumulation, may not however, be now altogether out of place, keeping in view an established principle in experimental science, that we are said to explain any phænomenon when we shew it to be necessarily included in some other phænomenon, or fact already known.

29. It is reasonable to infer, that in every case of duplicate proportion, two equal and concurring causes are present; for as observed by the learned Dr. Clarke, to suppose any effect whatever, to be as the square, or the cube of its cause, is to suppose that such effect arises partly from its cause, and partly from nothing. Thus in the case of the free action of an electrical accumulation, as estimated by means of its attractive force operating between two conductors. *(a) (b) fig.* 15. there are, as already observed (15) two separate causes to be considered; the quantity of matter accumulated, and the controlling power of the uninsulated coating: and it has been observed (14) that the free action will be in a direct proportion to the quantity of matter, and in an inverse proportion to the controlling power. If, therefore, as the quantity of matter is increased the controlling power of the uninsulated coating should from any cause be diminished, and in an inverse ratio, then the free action must necessarily be in a duplicate proportion; and such a conclusion is by no means unwarranted by known facts.

We have already had occasion to remark, (14) that when an insulated and uninsulated conductor are directly opposed to each other, and are separated by a non-conducting interval, the capability of the former to retain a given accumulation is,

* See page 64.

all other things remaining the same, considerably increased; for the accumulation being determined by the proximity of the two conductors, immediately upon the uninsulated one, a portion of the natural electricity of the latter becomes displaced, and thus it appropriates to itself, a great part of the resulting action. In the operation of the Leyden jar, however, the natural electricity of the insulated coating, not having the same unlimited room to recede, in consequence of the intervening glass, the effect of the inductive influence in controlling the free action is not proportionate to the quantity accumulated. Hence, the respective quantities set free, as arising from this cause alone, must continue to increase in a simple ratio of the accumulation.*

But in order to estimate the whole amount of the free action, we have also to take into the account, the simultaneous influence of the matter thus set free, on the outside of the jar, by which the controlling power is at length destroyed, and the whole accumulation caused to pass in the form of an explosion; by increasing the quantity accumulated, we have, therefore, not only an increased quantity set free; but also an increased neutralizing influence, which operating upon the negative coating, either immediately through the balls of the electrometer, or otherwise through the surrounding medium, as in the case of a spontaneous explosion over the uncoated interval; the exclusive action between the coatings in the direction of the intervening glass, will be necessarily diminished, that is to say, the controlling influence in the latter direction, *will be more or less neutralized by a similar and opposite force.*

* It is quite immaterial in this investigation, whether we consider an artificial electrical accumulation, to commence first from the negative coating, which may be supposed to happen in charging a jar, by the transfer of its own electricity, (exp. 1.) or otherwise from the positive coating, as may be supposed to occur in charging an uninsulated jar, (exp. 2.) In either case, the quantities set free will be precisely the same; since, in the one instance, the quantity displaced may be supposed to *precede* the quantity accumulated, in the other, to *succeed* it.

It is further to be observed, since the tendency to a state of equal distribution, in the direction of the balls of the electrometer may be supposed to increase, not only with the quantity accumulated, but also with the displacement from the opposite coating: we may likewise estimate the quantity set free, under these conditions, and consider merely the power of controlling the free action, as depending on these two causes taken together. In which case, this power will continually decrease, in an inverse ratio of the square of the quantity accumulated, (exp. 4), until it vanishes at the instant of the explosion; whilst the indicated attractive force will consequently *increase* in a direct ratio of the square of the same quantity, and the effect is still proportionate to its cause; that is to say, to the quantity set free.

This duplicate proportion will not, however, become apparent in the interval which the accumulation can pass; since by increasing the intervals between the exploding points, we diminish the attractive force; the quantity of matter being constant, in the inverse ratio of the squares of the respective distances, as already explained. (20.) The attractive force therefore of the free action, considered as a constant quantity, is at a double interval, reduced to one-fourth, and the explosion cannot pass at a double interval, until an equivalent attraction is obtained, that is to say, until four times the quantity is set free, which will be when double the quantity is accumulated.

30. In disposing the same quantity of matter on double the surface, we have also a duplicate proportion indicated by the decrease of the free action; as observed (exp. 16); in this instance, we may also trace the joint effects of these two concurring causes. It will be readily perceived, that to dispose the same quantity of matter on a double surface, is the same thing as regards the attractive force of the free action, as disposing half the quantity on the same surface; for

let the double surface be supposed to be divided into two parts, each equal and similar to the single surface, then the quantity will be divided in the same proportion, one half remaining with one part, and the other half with the other. We have only therefore, to determine the resulting attractive effect, for one of these portions, and we obtain the indicated attraction of both, (21) since the attractive force of the free action is the same with one jar, as with any given number, when the quantity of matter is made to vary with the number of jars. (exp. 11.) Now by disposing half the quantity on the same surface, that is by diminishing the quantity one half, we at the same time double the controlling power of the uninsulated coating, since the latter is increased as the difference from a state of equal distribution is decreased: and hence, by the joint action of these concurring causes, we have only one-fourth part the attractive force.

This duplicate proportion, will not however become apparent in the interval which the explosion can pass; (exp. 11) for as already observed, (20)* the attractive force being in an inverse ratio of the square of the distance, the explosion can with the same quantity of matter still pass at one half the interval; since by diminishing the distance between the balls one half, we quadruple the attractive force; the quantity of matter being constant.

The converse of this reasoning will be readily admitted, in its application to the duplicate proportion observable in accumulating the same quantity of matter, on half the extent of coated glass, the one being the reciprocal of the other, and is included in the general expression $A \propto \frac{I}{S_2}$ (21); taking care to remember, that by s, we denote the extent of coated glass, considered as a simple quantity without reference to its two surfaces.

* See page 64.

31. The various instruments, employed as measures of these different states of the free action, which we have been just considering, have been supposed merely to indicate the deviation of the accumulated electricity, from a state of natural distribution; and to have no relation to the quantity accumulated:* but such a conclusion must be taken with considerable limitation. It is true, that as much free action may be evinced by a jar containing only a square foot, as by a jar containing ten square feet, or by a battery containing one hundred. But when we take into the account the laws above mentioned, (21) we immediately perceive that there is an important connection existing between the indicated attractive force, the quantity of matter set free, and the relative quantity accumulated. Thus if a given quantity of matter be accumulated on a square foot of coated glass, and it indicate an attractive force, which we will call 1, then supposing the same quantity to be disposed on ten square feet, its free action will be reduced to one hundredth, (21) that is to say, there will be only the one-hundredth part of one-tenth of the whole set free from each jar, since the matter is disposed on ten jars. (30) If therefore, the free action should become the same as before, then one hundred times the above quantity will be set free from each jar; and ten times the original quantity of matter will be accumulated on the whole.

32. The duplicate proportion observable in the general law of electrical attraction, already noticed, (20) will be found to involve a similar concurrence of two equal causes; since it may be shewn by a very easy experimental analysis, that the whole attractive force depends, first, on the force induced in the attracted body, and secondly, on the distance at which the force so induced is caused to act. If therefore, whilst we diminish the distance one half, it should be found that the force induced in the attracted body is doubled, then we have neces-

* Singer's Electricity, p. 139.

sarily four times the attraction. If the distance be diminished to one-third, and the force induced in the attracted body be tripled, then we have nine times the attraction, and so on. There are a few very simple experiments to be adduced in support of this view of electrical action.

Exp. 24. A large jar, containing about five square feet, was connected with the insulated conductor of the electrometer, (*fig.* 6) and with the conductor of the machine, as in *fig.* 15; the whole being insulated, and the quantity of matter measured by the explosions of a small jar, charging from the outer coating, on the principle already explained, (12) and represented in *figs.* 13 and 16. A third conductor, (*c*, *fig.* 20) with flattened surfaces, was now carefully insulated, and interposed between the insulated and suspended conductors; (*a*) (*b*) under these conditions, the weight requisite to balance the attractive force, measures the force induced in this intermediate conductor, (*c*) at different distances from the insulated conductor, (*b*) the distance (*a c*) between the suspended and interposed conductors, remaining in each case the same. Now the induced force, was found *within certain limits* to vary in a simple inverse ratio of the distance (*c b*) between the insulated and interposed conductor. Thus the insulated conductor (*b*) being depressed from contact with the interposed conductor, (*c*) through an interval of two-tenths of an inch, and an accumulation caused to take place, expressed by twenty explosions of the small jar; the weight requisite to balance the attractive force, amounted to eight grains; the distance from the suspended conductor being about two-tenths of an inch: the interval (*c b*) being now doubled, by depressing the lower insulated conductor (*b*) another two-tenths, the attractive force amounted to four grains: the interval (*c b*) being increased to six-tenths, the attractive force amounted to about two grains and half: the induced attraction therefore, varied in an inverse simple ratio of the distance, (*c b*) all other things remaining the same. By a further extension of this experiment, it became also apparent, that the induced force so long as the inductive action could proceed with facility, was directly as the force of the free action; for by increasing the quantity of matter accumulated by about half as much again, so as to double the free action, according to the laws already determined. (20) The induced attractive force at a certain distance was also doubled; the free action being quadrupled by doubling the accumulation, the induced force was also quadrupled. (21) This law however, as the disturbance in the interposed conductor became considerable, began to vary; the state of unequal distribution not being equally susceptible of further change.

Exp. 25. The interposed conductor (*c*) being removed, and the attractive force at a given distance (*b d*, *fig.* 15) being determined, a second accumulation was caused to take place, so as to give at the same distance, a force double the former. This double force, being caused to operate on the suspended conductor at a double interval, the respective attractive forces were found to be reciprocally proportional to the distances between the insulated and suspended conductors. (*a*) (*b*) Now in these instances, the induced force in the suspended body (*b*) must have been the same, since a double inductive force 2 A *fig.* 21, acting at a given distance, will be equivalent to a single inductive force, (A) acting at one half that distance—the inductive effect being as just shewn, (exp. 24) inversely as the distances. This result although a necessary consequence, when we assume, that the force of electrical attraction, varies in an inverse duplicate ratio of the distance, still involves the important fact, *that the induced force being constant, the attractive force varies in an inverse simple ratio of the distance between the attracting bodies.* These results therefore, go to prove, that the duplicate proportion observable in the general law of electrical attraction, may be referred to the operation of two concurring and equal causes; that is to say, to the induced force, and to the distance at which the force so induced acts.

when therefore, these vary together, and in an inverse proportion, we have the inverse duplicate ratio above mentioned.

It may not be uninteresting to remark, that similar effects are observable in the action of a magnet on a mass of iron; the attractive force being directly as the force induced in the iron, and inversely as its distance from the magnet, whilst the inductive effect is directly as the power of the magnet, and inversely as its distance from the iron: and it is also demonstrable, that when the inductive effect on the iron can no longer proceed, the attractive force is not in an inverse duplicate proportion, but in an inverse simple ratio of the distance, as I have endeavoured to shew elsewhere.*

33. The reasoning which has been advanced (29. 30) in explanation of the duplicate proportion observable in the attractive force of the free action, admits of much useful elucidation, when the quantities are represented by analogous geometrical magnitudes; a method which frequently enables us to demonstrate theorems relating to such quantities, with great readiness and precision; and developes many important facts which otherwise would not so readily appear.

Since the quantity of matter accumulated on a charged surface may be supposed to proceed by equal increments (13) therefore it may be represented by any magnitude supposed to flow uniformly. Let, therefore, the line A c, *fig.* 22. move parallel to itself upon the line (*c d*,) and generate the equal spaces *c e*, *m f*, *n g*, &c. then the rectangular space A, B, *c d*, may stand for and represent the whole quantity accumulated; and because, as we have endeavoured to shew (29) the controlling power is constantly decreased, as the quantity of matter is increased, until it vanishes at the time of the explosion; therefore, it may be represented by any magnitude

* Experimental Researches, on the Laws of Magnetic Action.

supposed to flow; and at the same time continually decrease as the accumulation increases. Let therefore the line A *c*, also move parallel to itself, in the direction *c d*, and continually decrease by the quantities *e h*, *f i*, *g k*, *&c.* which are proportional to the lines A *e*, A *f*, A *g*, *&c.* that is, to the respective quantities of matter, and so generate the diminishing triangular space A *d c*, which may consequently stand for, and represent the whole of the controlling power: then the quantity of matter first accumulated being represented by the space *c e*, the quantity controlled will be represented by the space *c h*, and the quantity set free by the triangle, A *e h*; in the same way, a double quantity of matter will be represented by the double space *c f*, the quantity controlled by the space *c i*, and the quantity set free by the triangle, A *f i*, and so on. But the triangles A *e h*, A *f i*, are to each other as the square of A *e*, to the square of A *f*; and since A *f*, is double of A *e*, these triangles are to each other as four to one. In the same way it may be shewn, that the triangles A *e h*, A *g k*, are to each other as nine to one, and so on: and as these triangles stand for the free action, whilst the sides A *g*, A *f*, A *e*, are proportional to the respective quantities of matter accumulated; it is so far demonstrable that the free action of any given accumulation, is, all other things remaining the same, directly proportional to the square of the quantity of matter.

In a similar way, if the lines A *e*, A *f*, stand for the intervals which the force of the free action can pass, and the relative quantities set free, be represented by the triangles A *e h*, A *f i*, &c. as before, then in drawing a curve line C, D, E, F, G, so that the ordinates D *e*, E *f*, &c. may vary in an inverse ratio of the squares of their distances from the point A; these ordinates D *e*, E *f*, &c. may stand for the relative attractive force of any given quantity of matter at the respective distances A *e*, A *f*, &c. (20. exp. 14.)

If therefore, when the quantity set free is A *e h*, the explosion takes place, the interval being A *e*, and the attractive force

D e, then, in supposing the interval A e to be made twice as great, that is to become A f, the attractive force of the same quantity of matter would be represented by E f, and the explosion could not occur at this interval with the same quantity accumulated; but in doubling the accumulation, the quantity set free would be represented by the triangle A f i, that is, it would be four times as great, and the magnitude of the whole attractive force, would become equal to four times E f, that is, it would be equal to D e, as before, and the explosion must then again take place. In a similar way, it may be shewn, that when the interval A e, is extended to A g, the attractive force D E, of the same quantity of matter A e h, is reduced to one-ninth of D e, that is, to F g, whilst the quantity set free, when three times the matter is accumulated, being represented by the triangle A g k, becomes nine times as great; the explosion will therefore again pass at this interval, for the whole attraction will become nine times F g, that is, D e as before, and so on;* hence the interval which the explosion can pass, will be directly as the quantity *accumulated.* (20)

34. The duplicate ratio observable in comparing the effects of the explosion, (23) would seem to be of a more intricate character, the concurring causes by the joint action of which it is produced not being very apparent. We might indeed be led to conclude, from the circumstance of the effect being as the quantity of matter set free, (29) that it depended exclusively on the state of the free action; which we have seen is as the square of the quantity accumulated. (21) But such a conclusion is not warranted by the subsequent phænomena, for the same quantity of matter is always equivalent to the same effect, whatever be the area of the coating, or the thickness of the glass, provided the surface be in an undivided state, and all other things remain unchanged. (exp. 21.) Since therefore, the same accumulation, disposed on jars, varying in size and thickness, exists in very different states of controlled

* That is: equal to $D e$, at a double, triple, &c. distance—see page 64.

action, the effect must have reference only to the quantity of matter *accumulated.*

This question however, may possibly admit of much elucidation, by taking into consideration, not only the quantity of matter accumulated, but the velocity with which it passes from the positive to the negative coating. Now it is not unreasonable to suppose, that the latter will be as the attractive force, exerted between the opposite electrical states; which being an effect proportionate to a given cause, must necessarily be as the deviation from a state of equal distribution; that is as the quantity accumulated: and hence, a double quantity of matter, will exert a double attractive force; and consequently, pass with a double velocity—it will therefore, have *four times the momentum.* For a similar reason, a triple quantity of matter, would have three times the attractive force, and consequently pass with a triple volocity; and hence, have nine times the momentum.*

35, The attractive force, exerted between the opposite electrical states, will necessarily be independant of all those indications developed by the uncontrolled action; even those resulting from the area of the coating, or thickness of the glass: it must in fact be considered, as the disposition or tendency of a certain natural power, or powers, to a state of equal

* In assuming the attractive force to be proportional to the quantity accumulated, we have to consider the immediate force exerted between the opposite electrical states, at the instant the circuit is made complete, and not the attractive force of the free action, in relation to the quantity accumulated, which as already observed, is proportional to the square of the accumulation. We have already shewn, (29) that this effect results from an increased quantity of matter, and a decreased controlling power; so that if with a double accumulation, there is evinced four times the attractive force, it is because there is four times the quantity of matter set free; and the attractive force is still proportionate to the quantity of matter in action, as we have just assumed.

distribution, through a given circuit. For although we sometimes observe, that the attractive force exerted between the opposed coatings, is sufficient to break down the intervening glass, when accumulated on a small extent of coating, which does not happen on a more extended surface; yet, we must not from this effect conclude, that the mutual attraction of the opposite electrical states, through a given circuit, is on this account either increased, or otherwise diminished. The tendency to an equal distribution, cannot be in any other proportion than that of the variation from the natural state, that is to say, of the quantity accumulated. The power indicated by a spontaneous explosion, through the sides of a glass jar, depends exclusively on the number of points, to which the attractive force is confined, so that on a great extent of coating, there is less action in any given direction. But the absolute quantity of attractive force, as relating to the deviation from the natural state, remains unchanged; the accumulation, whilst in the act of passing through a given circuit *(n b,) fig.* 14, being drawn from every point of the intervening glass through the medium of the opposed coatings, and finally concentrated upon what may be considered as two centres of action *(d) (b.)* So long as the circuit, and the quantity of matter therefore, remain unchanged, the same attractive force at the instant of the explosion will be in action; whether the matter shall have been previously diffused over a large surface, or a small one; or otherwise, whether it be disposed on thick glass or on thin.

We are hence led to infer, that when the circuit is made complete, that is, when all distance between the opposed coatings, is, as it were, annihilated; it is no longer the attractive force, as exerted through the intervening glass, or the extent of coated surface, or the indications of the free action which we have to consider. Every thing relating to these, at once vanishes; for the great condition upon which their observed influence rested, that is to say, the separation of the opposite states, by the intervening glass is destroyed; and we have now only to look to the variation, from the natural state of distribution, that is to the quantity of matter accumulated, and to its attractive force through a given circuit, that is to the relative velocity with which it passes; and therefore, it is not unreasonable to infer, that the duplicate proportion observable in the explosive effect of the accumulation on a metallic wire, (23) may depend on these two causes, taken together; so that when the matter is doubled, and the velocity also necessarily doubled, the effect must be quadrupled; or, in other words, *it must be proportionate to the momentum, with which the given quantity of matter pervades the metal.*

36. These views derive much support from a few admitted and important facts—thus, when a given charge is caused to pervade a great extent of circuit, much of its power is lost, and the explosion of the battery at other times remarkably loud, is then scarcely audible,* and to fuse any quantity of metal with a given charge, we make the circuit as short as possible; the effect of the explosion on the wire of the electrometer, *fig.* 8, is found to be greatly diminished by increasing the length of the circuit, that is to say, by retarding the velocity of the charge, and the effect seems to decrease in an inverse ratio to the obstacle to be overcome, so that in transmitting the charge through imperfect conductors, such as water contained in glass tubes, the velocity of the explosion is so much diminished, that the effect, otherwise considerable, is no longer to be appreciated.

It is not improbable, but that the decreased effect of the explosion observed in disposing the accumulation on a divided surface, (22) arises in a great measure, from this cause; since, in employing many jars, we necessarily increase the number of charging and connecting conductors; indeed, the results given in Table I, seem to warrant such a conclusion; for supposing the number of jars to stand for the respective increase

* Singer's Electricity, p. 176.

of conductors, the corresponding decrements in the effect, will be nearly in a direct proportion to the number of conductors.

37. In the analysis which has been given of the progress of an electrical accumulation, (33) it may be inferred from the equality of the triangles A *d c*, A *d* B, that at the instant of the explosion, the free action is equal to the controlled action; which may be readily conceived to be the case—for at this instant, the tendency of the free action through the balls of the electrometer (*a*) (*b*) *fig.* 14, being equivalent to neutralize all the controlling power, the whole accumulation is set free in the act of exploding, and a state of equal distribution ensues.

If therefore, we suppose the explosion to occur with a single quantity of matter *c e* at the interval A *e*, *fig.* 23, then the free action will be represented by the triangle A *e m*, and the controlled action by the triangle A *m c;* when the interval is increased to A *f*, and the quantity of matter to *c f*, then the free action is represented by the triangle A *f n*, and the controlled action by the triangle A *n c*, and so on; it is only necessary to observe, that in estimating the free action by its attractive force, as indicated by a moveable electrometer, the free action of the first quantity of matter *c e* will no longer be represented by the triangle A *m e*, when the interval A *e* is doubled, but by the triangle A *e r* or one-half of the former—that is by one-quarter part of the triangle A *f n ;* since to obtain a double accumulation, by means of a moveable electrometer, we must oppose to the attractive force of the free action at the time of the explosion, four times the weight (exp. 15.); when, therefore, the interval is doubled, the respective quantities set free will be represented by the triangles A *e r*, A *f n;* when the interval is tripled by the triangles A *e s*, A *f t*, A *g o ;* when the interval is quadrupled by the triangles A *e h*, A *f i*, A *g k*, A B *d*. The free action being as the square of the quantity accumulated as already observed (21.)

I have ventured on these theoretical observations, more with a view of tracing the connection which necessarily subsists between these interesting phænomena, and of applying general principles to the explanation of particular facts, than with any intention of having such observations considered as incontrovertible. The theory which they include, must rest on observation and experiment, and its evidence must therefore increase or decrease with the number of facts to which it can be applied, and the precision with which it explains them.

38. It may not be improper, before concluding this paper, to notice some circumstances connected with electrical investigations, which appear calculated to involve them in some uncertainty; on which account they merit particular attention.

In the application of electrical jars to the purposes of investigation, it is quite essential in certain experiments requiring great precision, not only that they expose the same extent of coated surface, but that they be in every other respect precisely similar. Now there are many circumstances affecting the identity of coated jars—it is already known, that the charge which a jar can receive as estimated by its attractive force, is in some direct ratio of the area of the coating, and in some inverse ratio of the thickness of the glass. A thin jar, having the same extent of coated surface, will therefore, with the same attraction, always ignite more wire than a thick one: it must be remembered however, that this is not in consequence of the difference in the thickness, but because there is absolutely more electricity accumulated with a given attractive force. (14) It was shown (exp. 21) that the quantity of matter being the same, the effect does not vary whatever be the thickness of the glass, or even the area of the coating, provided the jar can receive the given accumulation. The way in which the coating is applied, is another circumstance which will also materially influence the action of a jar; so that although the thickness of the glass, and the area of the coating be the same, the quantity of matter corresponding to a given attractive force, shall greatly vary; and the quantity of matter being the same, the effect shall no longer be identical. This is the case when a layer of paper is interposed between the coating and the glass; which is sometimes resorted to in order to diminish the chance of fracture.* Thus in selecting some jars from a battery constructed by Mr. Cuthbertson, it was observed, that one of them materially differed from the rest; it would admit of a much greater quantity of matter being disposed on it, with a given intensity—but the quantities of matter beiug equal, the action of this jar was less than either of the others by nearly one half. On examining the jar attentively, a layer of writing paper was found to be interposed between the outer coating and the glass; this being removed, and the coating restored, the jar acted in every respect like the others. The paper therefore being an imperfect conductor, impedes the free transmission of the accumulation upon the surface of the glass; and hence the force of the explosion becomes diminished: for the same reason it keeps down the tendency of the accumulation, through the balls of the electrometer, by which the controlling power is increased, as before explained (29.): every species of cement employed to attach the coating to the glass, will consequently operate more or less to the disadvantage of the action of the jar, according as it has a greater or less insulating power, and is applied in greater or less quantity.

39. It is therefore essential, where great accuracy is required, to ascertain in some investigations, the action of each jar separately. If two jars, with the same quantity of matter, explode over a given interval, or exhibit the same attractive force, or produce the same effect as estimated by any of the foregoing methods, (13, 15, 7) then they may be con-

* Singer's Electricity, p. 18C.

sidered as identical; if not, the separate effects due to each should be noted, and the mean result taken.

40. The way in which a series of jars are arranged, may also affect our results; when for instance, we increase the number of jars, and instead of arranging them about a common centre, as in *fig.* 17, in which case, each jar may be supposed to operate, as if disconnected with the others; we dispose them as in *fig.* 18, one jar only being connected with the conductor, and the remaining jars with each other; there appears to arise in the latter arrangement, a greater impediment to the free transmission of the accumulation, and although the difference is not considerable when two or three jars only are employed, yet in an extensive series it is of great importance. I arranged a battery of five jars, each jar containing five square feet, (according to these methods,) and having charged it in both cases alike, the corresponding effects on the wire of the electrometer amounted to 56° and 70°; the loss being by the arrangement in *fig.* 18, about one-fifth. This circumstance may also arise from the increased number of conductors, which the accumulation has to traverse; since each jar, except the first, instead of discharging through the line *(a b)*, has to discharge through that line, and its connexion with the first jar.

41. The usual method of estimating the quantity of matter by the fusion of wire being very uncertain in practice, our results may be rendered unsatisfactory from this circumstance; indeed it is admitted, by many careful experimentalists, that wires may become fused, with but slight variations in appearance, when very different quantities of electricity are passed through them:* beside which, the difficulty of ascertaining with precision, the point at which the fusion takes place, so that the wire may be just made red through its whole length, and then drop into balls, is very considerable; and we seldom

* Singer's Electricity, p. 180.

feel assured, that the given charge is not adequate to a somewhat greater effect: this in many investigations, is of material consequence; since the quantity of wire fused, varies in a duplicate ratio of the quantity of electricity passed through.

On this subject, Mr. Cuthbertson has the following observations; he says, alluding to some experiments by Dr. Van Marum, "That he, (Dr. Van Marum) might not have been aware of the different degrees of ignition, caused by electrical discharges, but only judged of the force, by the wires being converted into balls, by which great mistakes will happen; for if a wire be taken, eighteen inches long, and of such a diameter, that when a jar or battery is charged to such a height, as just to cause it to run into balls, much shorter lengths of the same wire, may be subjected to the same force, and still be only converted into balls. If only seven inches were taken, nothing but balls appear; the only difference will be that the balls will be smaller, and dispersed to a greater distance; which may be easily overlooked." He concludes by observing, "That the *lowest* degree of ignition must be had, so that when the charge is passed, the wire shall be red hot through its whole length, and then fall into balls." *

42. The method sometimes resorted to by electricians, in order to increase the capacity of a coated jar, by breathing or damping the uncoated interval on the inside, is also calculated to change materially the conditions of the experiment. Mr. Cuthbertson happened casually to discover, that a coated jar, when it was a little damp on the inside, would take a higher charge, than it would do after it had been coated for some time, and was quite dry on the inside. From this he says, "It appeared evident to me, that if I could by any means render the inside of the jars regularly damp, it would answer the same purpose. Breathing into a jar was tried, and the success was such, that it would receive and retain nearly double the

* Cuthbertson's Practical Electricty, ps. 180, 185, 186.

quantity of electricity it could retain when dry; and in trying to ignite wire with the charge of one jar in a dry state, no more than five inches could be ignited; though after breathing into it, twelve inches were fused."* Hence, it is evident, that by damping the inner surface, we completely change the relative operation of the jar: it is in fact, little more than an ingenious method of increasing the inner coating, but in such way as to extend the surface, by means of an imperfect conductor, over which the electricity is diffused, and so increase the quantity; the attractive force of the free action remaining the same. If we consider the intensity therefore, in relation to the quantity of matter, it may be said to be diminished; more especially at that point, from which it has the greatest tendency to explode: in the application of this method to the purposes of accurate investigation, we are consequently exposed to great uncertainty.

Thus, in experiments 146 and 147 of Mr. Cuthbertson's useful work, it may be observed, (exp. 146) that two inches of wire became fused, by a charge of fifteen grains; and in exp. 147, eight inches became fused, with a charge of thirty grains: but in the latter case it was necessary to breathe into the jar, so as to accumulate a given quantity of matter, which must have been more than equivalent to an attractive force of thirty grains; every thing remaining as in the previous experiment. To have been accurate in these experiments, the jar should have been damped in each case alike; by which it would have been placed under the same circumstances when a charge of fifteen grains was accumulated, as those under which it was placed when a charge of 30 grains was accumulated; and then the result as before observed by Mr. Cuthbertson, would have been widely different; for the jar in the former case, would have been adequate to a much greater effect, so that from these experiments we cannot arrive at any just conclusion, respecting the relation which subsists

* Cuthbertson's Practial Electricity, p. 170.

between the quantity of wire fused, and the intensity of the accumulation; which from the investigations already detailed, (21, 23) may be easily determined: since the quantity of matter is as the square root of the attractive force; (21) and the effect is as the square of the quantity of matter; (23) The effect, and the indicated attractive force, should therefore vary together; all other things remaining the same, and consequently the charge of thirty grains, should only have fused twice the length of wire.

It is rather important to notice the circumstance, that such would actually have been the case, or very nearly so, provided the jar had been damped in the previous instance, when a charge of fifteen grains was accumulated; according to what is previously stated by Mr. Cuthbertson, and which has been just detailed; since the same proportionate increase of capacity as that above-mentioned, must have taken place, even with the same intensity; that is to say, the jar being damped, could have received with the given intensity of fifteen grains, an additional quantity of matter. Now the effect being as the square of the accumulation, it would only have required the addition of about half as much more matter, with the same intensity, in order to have doubled the quantity of wire fused; which, considering the influence of the increased capacity, might have been soon effected. Indeed, if we suppose the ratio of 12:5 already stated, which is nearly as 2 : 1, to express the increased capacity with a given intensity, then the result would correspond, or very nearly so. When the difficulty of ascertaining the precise quantity which the respective charges could fuse is taken into account, the difference will not appear to be very considerable.*

* There does not seem to be any difficulty in accumulating the requisite charge in a jar, provided the positive coating is furnished with a paper band, as ingeniously recommended by Mr. Singer, and the jar freed from a cover: and in order to preserve the state of the jar invariable, all the uncoated interval both inside and out, should be carefully varnished—in this case the action of the jar may be depended on.

43. The various circumstances which we have detailed being duly considered, it will not seem extraordinary, that many well contrived experiments should have been productive of unsatisfactory results; and that the conclusions arrived at by practical electricians should have been different. Thus Dr. Van Marum found his batteries to increase in power only, in the same proportion as the coated surface: viz. that a double surface of coated glass could only ignite double lengths of wire, of the same diameter, which Mr. Cuthbertson considers to be erroneous, because he found by his method of experiment, that double quantities of electric fluid in the form of a discharge, will ignite four times the lengths of wire, that is to say, he found the effect, in this instance, to be as the square of the quantity of matter. Yet we find p. 182, exp. 149, that this result varied; and p. 185 we observe, that when the quantities of matter were as 3 : 2, this law was no longer apparent; for exps. 150 and 151 shew, that in this case, the lengths of wire ignited, instead of being as 9 : 4, were as 6 : 2; that is, as 3 : 1. No general conclusion therefore could be arrived at, concerning this law of electrical action on wires, which we have found (23) is always directly as the square of the quantity of matter, all other things remaining the same.

44. Much uncertainty in electrical investigations may be avoided, by measuring the quantity of matter accumulated by means of the explosions of a small jar charging from the outer coatings, as already explained *fig.* 16, the discharge being effected by means of the discharging electrometer, represented in *fig.* 4. In this case, the electrometers usually employed to measure the charge by its attractive force, may be dispensed with; thus the experiment is placed under the simplest form, since the same quantity of matter so estimated, is always equivalent to the same effect, the surface being constant, whatever be the thickness of the glass, or the area of the coating, exp. 21, whilst the measure we employ may be considered as invariable—the jar and the discharging electrometer affixed to it always remaining the same.

In referring to the works of Mr. Cuthbertson and Mr. Singer, my object has been solely to elucidate an intricate, but interesting, philosophical inquiry; and I hope it will be understood that in so doing, it is my wish to preserve every proper respect for the exertions of two able and ingenious men, whose loss the scientific world has so much to regret.

45. I shall now conclude with a short recapitulation of a few facts, which seem to be established by the preceding inquiries:

1—An electrical accumulation may be supposed to proceed by equal inrements.

A coated surface charging in any degree short of saturation, receives equal quantities in equal times, all other things remaining the same.

The quantity passing from the outer coating, is always proportional to the quantity added to the inner.

2—The quantity of matter accumulated, may be estimated by the revolutions of the plate of the electrical machine, supposing it in a state of uniform excitation; or it may be measured by the explosions of a jar connected with the outer coatings.

It is as the surface multiplied by the interval which the accumulation can pass:

When the surface is constant it is as the interval:

When the interval is constant it is as the surface.

It is also as the surface multiplied by the square root of the free action.

When the surface is constant, it is therefore as the square root of the attractive force.

3—The interval which the accumulation can pass, is directly proportional to the quantity of matter, and inversely proportional to the surface:

It is as the quantity divided by the surface:

If the matter and surface be either increased or decreased in the same proportion, the interval remains the same:

If as the matter be increased, the surface be decreased, the interval will be as the square of the quantity of matter.

4—The force of electrical attraction varies in the inverse ratio of the square of the distance between the points of contact of the opposed conductors, supposing the surfaces to be plane and parallel; or otherwise between two points, which fall within the respective hemispheres, at a distance equal to one-fifth of the radius, supposing the opposed surfaces to be spherical.

5—The free action is in a direct proportion to the square of the quantity of matter, and in an inverse proportion to the square of the surface.

It is directly as the effect of the explosion on a metallic wire, all other things remaining the same.

If the matter and the surface increase or decrease together, and in the same proportion, the attractive force remains the same.

If as the matter be increased, the surface be decreased, the attractive force is as the fourth power of the quantity of matter.

6—The effect of an electrical explosion, on a metallic wire, depends exclusively on the quantity of matter, and is not influenced by the intensity or free action.

It is diminished by accumulating the matter on a divided surface.

It is as the square of the quantity of the matter.

It is as the square of the interval which the accumulation can pass.

It is directly as the attractive force of the free action, all other things remaining, in each case, the same.

It is as the *momentum* with which the explosion pervades the metal.

Plymouth, November 17, 1825.

III.

PARTICULARS OF THE CONSTRUCTION OF A CAST-IRON BRIDGE OVER THE LARY NEAR PLYMOUTH, BY JAMES M. RENDEL, CIVIL ENGINEER; MEMBER OF THE ROYAL INSTITUTION OF CIVIL ENGINEERS; AND OF THE PLYMOUTH INSTITUTION.

THE construction of bridges of large dimensions has, in every civilized age and country, been considered an object of general interest. Nor is this to be wondered at, when we regard their utility, or the difficulties to be encountered in their erection. It is not however my intention to attempt the history of this interesting species of architecture—It has already been amply discussed in several valuable treatises—All that I propose in this paper, is to describe a work of great local importance, of difficult construction, and, in some respects, of novel arrangement.

The Lary bridge is constructed over an estuary, from which it derives its name, and is distant from Plymouth about one mile and a quarter.

It connects a large agricultural district, on the southern shores of the county, with the populous and improving neighbourhood of Plymouth.

The Earl of Morley, whose property at Saltram forms the southern bank of the Lary, early perceived the importance of a more direct and commodious communication than the circuitous route by Plympton; and, in the year 1807, engaged Mr. Alexander, an engineer of eminence, to survey and report, on the practicability of erecting a bridge for that purpose. That gentleman reported that, in consequence of the unfavourable nature of the bed of the river, the erection of such a structure would, (if at all practicable,) be attended with enormous expense. The idea of a bridge was therefore abandoned; but, fully convinced of the importance of the communication, his Lordship, being proprietor of the neighbouring antient Ferry between Oreston and Catdown, was enabled to establish a Ferry Boat of an improved character. By means of this boat, which, from its peculiar construction and accommodation was called a 'Flying Bridge', carriages of every description, with their horses attached, were ferried across the river with much greater safety and convenience than by any ferry boat of common construction. The success of this establishment sufficiently proved its utility to the public; but although superior to all other ferries in the neighbourhood, it was liable to interruption in bad weather and spring tides, and in proportion as the public became practically acquainted with its advantages, these interruptions were felt and regretted.

In September 1822, having projected a Bridge of Suspension across the Tamar at Saltash, I waited on the Earl of Morley to solicit his support. With that quickness, which in all matters of business characterizes his Lordship, he suggested the applicability of the principle to a bridge over the Lary, and directed me to turn my attention to a design for that purpose.

The drawings being approved, an Act of Parliament was obtained in the session of 1823 for carrying the plan into effect. Subsequently however, circumstances occurred to occasion the abandonment of the site first proposed, and the one on which the present bridge is built, being unfavourable to the erection of a bridge on the principle of suspension, the original intention was relinquished. In the session of 1824, another act was therefore obtained, repealing the act of 1823, so far as related to the Suspension Bridge, and extending its powers to meet the erection of the present structure.

Aware of the opinion of Mr. Alexander, I was anxious to acquaint myself with every circumstance that could be of importance, and therefore made a survey of the river. In the strait where the bridge is built, the waters are confined to a channel of about 550 feet wide (at high water,) formed by abrupt lime rock cliffs, which disappear immediately above the bridge, and leave the Lary a basin of considerable magnitude; receiving the waters of the river Plym, the Tavy, and minor streams.

On boring in several places, it was found that the substratum was schistos or slate rock, lying nearly horizontal, at a depth of 80 feet below high water. The superstratum consists of a mixture of granite sand, deposited by the Plym, and alluvial matter brought in by the tide, which, having accumulated to a depth of 60 feet, on an average, a considerable portion of the higher parts of the basin is, at low water, left dry.

On minutely examining the ground at the site of the bridge, it was discovered that, from the boundary of high water on the northern shore, the rock dipped at an angle of 80°, and on the southern, at an angle of 35°:—that the chasm was filled with the above described deposits, to a depth of 70 feet, to which we bored, and that the maximum surface velocity * of

* Having obtained the surface velocity in the middle of the stream, the velocity at the bottom is easily ascertained; for it has been found, by experiment, that if from the square root of the *surface velocity* expressed in inches per second, unity be subtracted, the square of the remainder is the velocity at the *bottom*. If, therefore, the former velocity be $= v$, the velocity at the bottom $= v - 2\sqrt{v} + 1$. or the mean velocity $= v - \sqrt{v} + \frac{1}{2}$.

spring tides, through this comparatively narrow channel, was three feet six inches per second, and their perpendicular rise from eighteen to nineteen feet.

It further appeared that inasmuch as the matter composing the bed of the river, was loose to a considerable depth, whatever tended, by narrowing the channel, to increase the velocity of the current, (such for instance as piers of a bridge,) would at the same time, deepen it. To avoid such obstructions, as much as possible, we determined on having the arches as large as a due attention to economy would admit. But as large *stone* arches are very ponderous, the expense of preparing adequate artificial foundations for their piers and abutments, on such ground, would have been much greater than it was deemed prudent to incur. And as cast-iron combines durability and strength, with lightness, it appeared the material best fitted to meet the several necessities of the case.

The value of iron, as a material for bridge building, is fully displayed, in many magnificent arches constructed in this country. Its application to such purposes, was an idea worthy of English artisans; and in point of boldness of design, and usefulness, is nearly allied to the invention of the steam-engine.

The Colebrook Dale company, had the honour of taking the lead in the construction of cast-iron bridges. In the year 1777, that company constructed the first over the Severn, immediately below their works. This bridge is one hundred feet span, and forty-five feet rise. As a first attempt, it may be considered a bold and ingenious design.—It is, however, defective in combination; but this derogates nothing from the merits of the inventors, who, observing the comparative incompressibility of iron, and the facility with which it could be moulded into any form, first saw, and demonstrated, its fitness for the construction of large arches.

Since the completion of the Colebrook Dale bridge, the advantages of iron, for such purposes, have occupied the attention of our most celebrated engineers; and the result has been the employment of it in the construction of some of the finest specimens of bridge architecture. We need only mention the one at Sunderland, the Southwark bridge, and one lately built over the Severn, near Tewkesbury.

To prove the superiority of iron, it need only be stated that the specific gravity of cast-iron, of the quality termed gun metal, is to the hardest description of granite as 2,75 to 1; but its power of resisting pressure, is in the proportion of 88 to 1. Hence it would appear that a pillar of the hardest granite would crush at its base, when raised to the height of 9600 feet—while a pillar of cast-iron would bear an elevation of 115,200 feet, before its base would give way.

It is this superiority of strength in proportion to its weight, which makes cast-iron of such value in the construction of large arches; and it is pleasing to reflect that, by a judicious combination of parts, we have the means of extending the mechanic bow, far beyond what could have been done with any other material.

In the construction of frame-work of every description, it should be a first care to avoid complexity and mutilation in the several parts. It should also be recollected, that quantity of material does not constitute strength, unless every part is accurately proportioned and adjusted to the several strains to which it is exposed. It is the due observance of this principle that stamps the value of every piece of framing, but more especially of that now under consideration.

In the construction of iron arches, (after having secured adequate abutments) let each segment of a circle, or any other curve composing a rib, be formed of pieces, as long as can conveniently be cast; and it is evident, that the form of the arch must be destroyed, or the abutments separated, before the bridge can come down. It is, therefore, only necessary to construct a segment, so that its form shall not be changed by the various weights which it may have to support, and to guard against its yielding sideways, and all that can be required is accomplished.

To insure permanence in the *form of the curve*, it is necessary to give the segment a depth proportionate to the chord of the arch; and to secure it in a *vertical plane*, a judicious distribution of matter is more important than quantity.

After these general remarks, which I have considered, in some degree, necessary to elucidate the subject, we proceed to the particular description of the Lary bridge.

The sketch, which accompanies this paper, is an accurate representation of it. In the arrangement, it will be seen, that I have differed materially from other works of a similar nature: First—in the form and termination of the piers, at the springing of the arches: and, second—in the curve of the arches, which instead of being segments of a circle, are segments of an ellipse; thus, in great measure, avoiding what I have been led to consider a defect, in other works of a like description. I allude to the unpleasant effect produced by small segments of a circle springing from straight sided piers, always disagreeable to the eye of an observer, from the abruptness of the angle. By the present arrangement, the arches, at a little distance, seem to form a continuous line with their piers; which, in unison with the superstructure, unbroken by the intrusion of unnecessary masonry, produce an effect that will, it is hoped, be found generally pleasing. The dimensions of the bridge, are as follow, viz.—The centre arch is one hundred feet span; its rise or springing, fourteen feet six inches: the thickness of piers at the springing, ten feet; their thickness at low water spring tides, fifteen feet: at the foundations, nineteen feet: their height, twenty-nine feet.

The adjoining arches are each 95 feet span; their rise or springing 13 feet 3 inches. The piers, taken as before, 9 feet 6 inches; 14 feet 6 inches; and 18 feet 6 inches respectively: their height 29 feet: the side arches 81 feet span; their rise or springing 10 feet 6 inches. The abutments at the level of the springing, 13 feet 6 inches; at the level of low water 17 feet; at the foundations 19 feet: their height from the foundations to the springing 28 feet.

To produce greater stability, the abutments are made to form an arch, which, abutting against the wing and approach walls, acts in opposition to the thrust of the arches of the bridge.

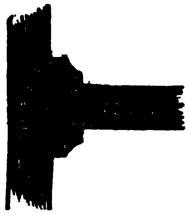
The arches spring from their piers and abutments about four feet above high water of spring tides. Their altitudes correspond with the curve or camber of the bridge between the abutments, which is formed by a radius of 4670 feet.

The roadway is 24 feet wide within the railings, 500 feet in length within the abutments, and in the centre of the bridge 22 feet above high water of spring tides.

In the width of the roadway each arch has five ribs, equidistant from each other, and each rib is cast in five pieces—they are cast solid, and their cross section is formed thus—

being 2 feet 8 inches in depth at the springing, 2 feet at the apex, and in every part 2 inches thick, with edge-flanges to give them lateral strength.

Cast-iron plates 25 feet long, 2 feet 8 inches wide, and 3 inches thick, are firmly bedded in the masonry of the piers and abutments, and receive the ends of the ribs in shoulderings or sockets, formed thus—



The intermediate ends of the ribs are cast with flanges, and are connected together transversely, by strong plates of iron, fixed at right angles to their line of direction, and to which they are connected by screw-bolts, two inches square.

The arch thus formed by lateral and transverse pieces, has 25 divisions or spaces; in each are fixed two braces, having the form of the letter X: their ends being screw-bolted to the ribs, operate as a system of diagonal bracing to the whole arch, and fix the ribs immoveably in a vertical plane.

The spaces between the extrados of the arch, and the roadway, are filled up with a system of triangles, the diagonal formed by their apexes being the true line of bearing, or perpendicular to the line of forces; thereby equalizing the weight of the superstructure over the whole arch. These triangles are preserved in a vertical plane by cast-iron tubes, abutting against their intersections, being tightened by a wrought-iron screw-bar, embracing the whole transversely.

Above the springing of the arches, the piers are composed of cast iron framing, fixed perpendicularly by diagonal braces and cross ties; their upper-ends terminating in a plate 4 feet long and 8 inches wide. On these plates, the ends of the bars which carry the covering or road-way plates, rest in grooves, and admit of a reciprocating motion, in the direction of their length;

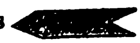
in order that any expansion or contraction in the arches, arising from change of temperature, may be provided against.

These bars are cast in the form of the letter T, and fixed vertically over the main ribs, and are consequently supported between the pier frames, and their intersections with the ribs, by the triangular braces before described; forming a flat arch for the whole length between the abutments of the bridge; the radius of which, as before stated, is 4670 feet. On these bars rest the covering or roadway-plates, 1 inch thick, 13 feet long, and 3 feet wide. They are laid in the tranverse direction of the roadway, and are connected laterally by flanges and screw-bolts, and transversely by dovetails; forming one sheet of cast iron, 26 feet wide and 500 feet long; which being firmly connected to the framing below, by strong dove-tail tenons, cast to the bearers, and wedged tight in corresponding mortices in the plates, serves the double purpose of roadway-plates and bracing, to the whole of the framing, by which it is supported. A bed of strong clay, four inches thick, covers the whole surface of these plates, upon which is laid, small broken stone in the usual way of making roads. Iron side-railings, and foot-ways of Cann slate, complete the superstructure.

In the construction of bridges of every description, it is of the utmost importance, that the directions of the joints of the several parts composing the arch, should be at right angles to the line formed by the several forces acting upon the arch, by means of its own and superincumbent weight: it is also important to the stability of the arch, that the line of thrust should pass through the whole of the parts composing the arch, in, as nearly as possible, the same relative point: the two postulates of an arch of equilibrium, about which so much has been written, with what success to the practical engineer, I must leave others to determine. The labours of Dr. Hutton, should however be appreciated; for, in a mathematical point of view, his theorem for an arch of equilibrium is clear and satisfactory, though the practical difficulty (or I would say impossibility) it involves, when the intrados are semi-circular or semi-elliptical, renders it almost useless to the bridge builder. But that an arch of equilibrium, with *any* description of curve for the intrados of the arch, can be obtained, is a fact, which I hope satisfactorily to prove in some future communication; it being inconsistent with the present design to enter more fully into the discussion: I would however remark, that the arches of the Lary bridge are constructed on this principle; and that the piers are made sufficiently thick to include the line of thrust, which has this advantage, that the destruction of one or more of the arches, would not affect the stability of the remainder; a circumstance which in the construction of bridges of several arches, claims particular attention.

In every kind of architecture, an adequate foundation is the first consideration; but as it most frequently happens in the construction of bridges that the foundations must be artificial, various modes have been resorted to. All are however expensive, and difficult of execution; and in cases where the ground is loose, and the stream rapid, extreme care is necessary, to secure them against all vicissitudes. Formerly, in the bed of a deep river, it was customary to make a foundation by driving a quantity of piles all over the space allotted, and the whole of the interstices, between the piles, being filled with small stone, the pile-heads were cut off at the level of low water, and the masonry commenced. But in such cases, the piers were immense masses, requiring to be protected with sterlings, which added to the size of the pier:—thus the water-way became so much reduced, and consequently the velocity of the current so much increased, that the bed of the river was not unfrequently washed away, the foundation undermined, and the safety of the fabric endangered. The old London bridge, and the old part of Rochester bridge, are instances of this kind. For this method, long since disused, there has been substituted, the more scientific and secure modes of constructing foundations by means of coffer-dams and caissons.

In few instances have the difficulties to be overcome, in the formation of foundations, exceeded those we had to contend with at the Lary bridge, as must be evident from the description of its site. These difficulties having been successfully met by methods somewhat new, it is hoped that the following particulars respecting them will be found interesting.

The works commenced by inclosing the areas of the intended foundations with sheeting piles of beech plank, four inches thick, and of convenient width; say from nine inches to fourteen inches. Their edges being prepared thus  and being driven quite close, effectually inclosed the areas of the foundations. These piles were driven to a depth of fourteen feet, in guide-frames, (to keep them perpendicular) by a pile engine, in which worked a cast-iron weight of 450lbs. The spaces thus inclosed were excavated by means of what were termed 'sand-spoons,' to a depth of from six to seven feet; they were worked by three men on stages, fixed about four feet above low water, the excavated sand being discharged over the sides of the piles. In appearance, these spoons resembled the ballast-dredge used on the Thames.

As the excavations were completed, the ground was piled with whole Memel or Norway timbers, the piles being arranged in rows, about four feet six inches apart from centre to centre, in each direction. These bearing piles, having to carry the whole weight, or nearly so, of the superstructure, were driven, not as customary to any prescribed depth, but until they would not sink more than one-eighth of an inch, with a weight of 15 cwt. falling from a height of 25 feet immediately upon their heads. They received twenty extra blows with the same weight and fall, after they had arrived at this degree of firmness, which in few cases happened until they were from thirty to thirty-five feet in the ground. Each of the pier foundations contained from sixty to seventy, according to the solidity of the ground, after a certain quantity had been driven. The abutment foundations had from seventy to eighty, and those on the north abutment are, on an average, forty-five feet deep. To pitch and drive such long timbers was by no means an easy matter. Temporary stages and platforms were erected about four feet above high water, and there the men worked the pile-engines.

The next operations were of more difficulty than any of the preceding, and required considerable care and accuracy in the execution. I allude to the levelling of the pile-heads, which were to be cut off at least nine feet below low water of spring tides; and the paving of the spaces between them with masonry.

From the nature of the bed of the river, it will be evident, that to exhaust the foundations of water, would have been impossible; since, however secure the sides of the dam might have been, the surrounding water would have forced itself below the dam, and made its appearance through the bottom. *

A saw of a similar description to those used by Mr. Milne in the construction of Blackfriars bridge, would have been sufficient to cut off the pile-heads: but to pave the spaces between them, it was necessary that the work should be laid open to the hands and eyes of the labourer. It was therefore proposed, that both operations should be performed by the assistance of a Diving-Bell; and economy being important, it occurred to me, that instead of a cast-iron bell, which, with its apparatus, would cost from £700. to £800. one of wood might be made

* So exceedingly loose is the bed of the river, that I feel convinced had it been possible to exhaust the water from the foundations *instantly*, the whole of the enclosed space would have been blown up, notwithstanding the increased density of the ground occasioned by the piling.

for one-fifth of the amount. The experiment was accordingly tried, and the result more than answered our expectations. I am induced to give a description of this bell, as its economy may render it useful to others. Our first care was to procure well seasoned elm wood, in boards of 1½ inch thick, and these were put together in two thicknesses, crossing each other and treenailed. The joints were dowelled and tongued; and, to render them air tight, flannel, saturated with a composition of bees' wax and rosin, was placed between them. In the top of the bell, lenses, such as are usually employed, were placed and bedded in the above-mentioned composition. Two hoops of wrought iron were then passed horizontally around the inside and outside of the bell, and screw-bolted together, so as completely to protect the wood work from internal or external pressure. Internal and external iron stays, in which were fixed the sling chains, crossed these horizontal hoops, and connected the top of the bell with the sides; and being screw-bolted to the hoops, distributed the weight of the bell, when slung, over the whole of the iron framing. The bell was 5 feet 9 inches long, 4 feet 6 inches wide, and 5 feet high; and required an additional weight of 3 tons 15 cwt. to sink it. The weights for this purpose were of cast-iron, hung round its sides. As the water was deep and the stream rapid, it was deemed expedient to guard effectually against the escape of air; the bell was therefore, as a further precaution, lined with sheet lead. Air was supplied to the divers in the usual way, and thus the several operations of levelling the pile-heads, paving the spaces between them, &c. were carried on with ease, certainty, and dispatch.

Platforms, composed of wood and stone work, of the form and dimensions of the several spaces inclosed by the sheeting piles, were constructed on the shores, and the joints being well caulked, and rendered water-tight, the first courses of masonry for the piers and abutments were built on them, to a height of from 3 feet 6 inches to 4 feet. In order to make this a floating mass, it was surrounded with wood work made perfectly water tight, and connected with the platform sustaining the masonry, by strong bars of iron, previously fitted to cast-iron sockets, bolted thereto, forming a sort of box about sixteen feet in height, and in length and breadth equal to the platform.—Thus prepared, the joint, formed by the connection of the sides and ends with the bottom, was caulked; and the whole becoming buoyant, was floated from the shore, and sunk on the foundations, previously prepared by the aid of the diving bell. When the masonry was built a few feet above the level of low water, the sides and ends of these caissons were disengaged from the bottom, and used in a similar operation for the next foundation. In construction and application, these caissons differed materially from any others with which I am acquainted.

I have before stated, that the greatest difficulty in the construction of a bridge of arches in this situation, arose from the extreme looseness of the natural bed of the river. It therefore became necessary, as the works proceeded, to adopt some effectual means of guarding the foundations against the influence of the increased velocity of the stream. An artificial bottoming quite across the river at the site of the bridge, appeared the only certain remedy, and it became a question what were the best materials and mode of accomplishing our purpose.

Having ascertained from experiments that the strong red clay, found in the limestone quarries in the neighbourhood of the bridge, did not waste when exposed to a current of water moving with a velocity of seven feet per second, acting immediately on its surface, it occurred to me, that this clay and the calcareous spar obtained from the same source, would form the best possible materials. As soon, therefore, as the bed of the river had scoured away to the depth at which we thought it expedient to commence this artificial bottoming, the work was begun by depositing the abovementioned clay, mixed with small stones, over the whole surface of the bed of the river, from 60 feet above, to 70 feet below, the bridge; which was proved to be the extent of the increased current. The clay was kept, as nearly as possible, about two feet thick, and lastly it was covered with rough blocks of limestone and spar, within one foot of the original bed of the river. The stone being thus firmly imbedded in the clay, while the clay (being impervious to the current) prevents the water getting down to, and acting on, the loose bottom; the whole is, by their united assistance, secured in a way that could not have been accomplished by either of the materials applied singly.

This bottoming will improve in hardness and strength, from marine accumulations filling the interstices between the stones, and from pressure &c.; so that ultimately, I have little doubt, (and the experience we have already had, fully justifies the opinion,) that the whole will be as compact and hard as many of our indurated rocks. The sectional form given to this bottoming will be clearly understood, on reference to the accompanying drawing of the bridge.

All the masonry, with the exception of such parts of the piers and abutments as are in contact with the iron work, which is in granite, is built with lime stone from the neighbouring quarries, belonging to the noble proprietor of the bridge. The piers and abutments are built with wrought blocks, in sizes varying from two to five tons each.

As the strength of masonry depends much on the goodness of the cement or mortar, particular care was observed in preparing the mortar for the work under water. One part of Puzzolana, to two parts of ground blue Lyas lime, were mixed under a mortar-mill, with three parts of sharp clean sand, until the whole formed a tough paste. Mortar of this description acquires the hardness of Portland stone, in the course of a month, though constantly immersed in water; but common lime and sand mortar, prepared in the most careful manner, will never acquire hardness under water, and should therefore be avoided in such situations.

The works began on the 4th of August, 1824—the first stone was laid on the 16th of March, 1825, and the bridge was opened on the 14th of July, 1827—on which day her Royal Highness the Duchess of Clarence and suite first passed over it.*

The foundations, masonry &c. of the bridge, were executed under contract by Messrs. Johnson, of the Plymouth Granite works, and of Holywell-street, London; the manner in which the work is finished, is their best praise. The iron superstructure is by that able and experienced founder, Mr. Hazledine, of Shrewsbury.

It is needless here to eulogize the public spirit evinced by the Earl of Morley in this important work; the expense of which was certain and considerable, whilst its returns could only be precarious. For the steady confidence with which

* The following inscription which was furnished by Mr. Waller, and approved and amended by the late Right Honourable George Canning, Mr. William Bankes, the Earl of Carlisle, the Rev. Charles Young, and other scholars of eminence, is affixed to a block of granite, at the northern extremity of the bridge.

HUNC PONTEM
SENATUS AUCTORITATE SUSCEPTUM
NOVAS ET COMMODAS VIAS
RECLUDENTEM
JOHANNES COMES DE MORLEY,
SUIS SUMPTIBUS
STRUENDUM CURAVIT.
OPUS INCHOATUM, A. D. 1824;
ABSOLUTUM, A. D. 1827.
J. M. RENDEL, ARCHITECTO.

his Lordship encouraged one, young both in years and in his profession, to meet and surmount the various obstacles and natural difficulties in the execution of this work, *personal* gratitude alone is due—but for the advantages derived from the bridge itself, the Earl of Morley has laid the public of Plymouth under lasting obligation.

The benefits to a nation, from such a spirit of truly patriotic liberality amongst her nobility, are incalculable. To the many magnificent exertions of it, England owes no small part of her commercial prosperity; and the names of the Dukes of Bridgewater, of Portland, &c. &c. should be venerated by every lover of his country, as powerful contributors to its present eminence. With regard to Plymouth, it is to be hoped that the example set by the noble Earl in this and other public works in the vicinity, may find imitators. The natural advantages of the town and port are great, and nothing appears to be wanting for raising them to a still higher scale of national importance, but a continuance of that enterprising and liberal spirit which is at present dawning amongst a large portion of the inhabitants.

Plymouth, Jan. 1829.

IV.

ON THE RISE AND DECLINE OF PARTICULAR MORTAL DISEASES, DURING THE LAST TWENTY-FIVE YEARS; WITH AN ATTEMPT TO ASCERTAIN THE LAW OF MORTALITY, IN RESPECT OF ITS DISTRIBUTION ON VARIOUS AGES, AND IN BOTH SEXES: BY EDWARD BLACKMORE, M. D. MEMBER OF THE ROYAL MEDICAL SOCIETY OF EDINBURGH, AND OF THE PLYMOUTH INSTITUTION.

Duntaxat Rerum Magnarum parva potest res
Exemplare dare, ac vestigia notitiai.
LUCRETIUS.

THE subject of this paper is contained in the following passage of MALTHUS's Essay on the Principle of Population, vol. 2, B. iv. c. 5.—" Nature will not be defeated in her purposes; the necessary mortality must come in some form or other; and the extirpation of one disease will only be the signal for the birth of another, perhaps more fatal. We cannot lower the waters of misery by pressing them down in different places, which must necessarily make them rise somewhere else—the only way in which we can hope to effect our purpose, is by drawing them off. In a country which keeps its population at a certain standard, if the average number of marriages and births be given, it is evident that the average number of deaths will be also given; and the channel through which the great stream of mortality is constantly flowing, will always carry off a given quantity. Now if we stop up any of the given channels, it is most perfectly clear that the stream must run with greater force through some of the other channels; that is, if we eradicate some diseases, others will become more fatal. In this case, the only distinguishable cause is the damming up a necessary outlet of mortality. The way in which it operates, is probably by increasing poverty, in consequence of a supply of labour too rapid for the demand. If the cow-pock should extirpate the small-pox, and yet the number of marriages continue the same, we shall find a very perceptible difference in the increased mortality of some other disease. Nothing could prevent this but a start in agriculture."—The view of the reign of death herein exhibited, is truly dark and startling. This doctrine of the constancy of mortality wears an aspect which is naturally calculated to repress the efforts of philanthrophists to extirpate diseases;—and the *fatalism* with which it invests mortality, tends to shut up mankind in hopeless subjection to the various ills of their condition. The passage moreover assumes, that mortal diseases will *necessarily* and *perpetually* exist; and thus for ever precludes the hope of man's attaining to a natural issue of his earthly existence in the exhaustion of mature old age.—Omitting to discuss the truth of this proposition in the abstract, as designating the law of mortality in a state of society where the *population is making pressure on the means of subsistence*, I propose to inquire—How far, from the register of deaths in the course of the last twenty-five years, mortality is shewn to be a constant quantity?—What changes have been wrought in the various channels through which the great stream of mortality has been flowing—*What relative proportion* is observable in the rise and fall of particular diseases?—Has, for example, the *depression* in the mortality of the SMALL-POX since the discovery of the COW-POCK, been a means of diminishing the general mortality in the *rate of that depression*; or, has an increase in the mortality of some other diseases, absorbed those whom the decline of the small-pox had permitted to survive? Can any natural explanation be assigned of the variations in the channels of mortality, and of the general constancy of death? or, is its invariable amount to be ascribed to an *inscrutable law of Divine Providence!*—"that," in the words of Dr. Woollcombe, "*which the plan of Providence in the creation of life requires?*" If there be such a determinate rule in the prevalence of death as Malthus expounds, what can MEDICINE effect in promoting the well being and life of the community?

The LONDON BILLS OF MORTALITY present us with the largest scale of deaths of any record within our reach; and they are of sufficient accuracy for the object of our inquiry. For although the designation of diseases in them is not scientific, and their materials are drawn from sources which might be presumed to be uncertain and inadequate; yet, as Dr. HEBERDEN has well remarked, "The agreement of the bills with each other at various periods, does alone carry with it a strong proof that the numbers under the several articles are by no means set down at random, but must be taken from the uniform operation of some permanent cause." And more exact proof of their general accuracy is to be found *in the accordance of the numbers of those diseases, taken together, which are known to be peculiarly prevalent at particular ages, with the total numbers which were ascertained to have died at those very ages.* It is only necessary to premise further, that 'THE BILLS' consist of two tables; one of the deaths at different ages, without distinguishing the fatal disease; the other of different diseases, without distinction of the particular ages, when they were severally fatal.

I select then, as proper tables for comparison, the BILLS for two periods of six years each, from 1795 to 1800 inclusive; and from 1820 to 1825 inclusive—for the proportion of one mortal disease to the total mortality in any given period, is assumed to be a fair subject of comparison with the proportion of the same mortal disease to the whole mortality in another period; and the variation educed by this comparison will be strictly correct, provided that either the periods of time, or the total deaths in each period, be equal. In the former of the above periods, the deaths among infants were 35,925; in the latter 32,439: giving *a reduction* in the mortality of infants, during these late years, of 3486 in a general mortality of 116,513; which reduction, if it were extended over the whole world, would make a gain to population of *twenty-seven millions* of infants in the course of the mortality of a generation of human beings!

We are now to examine by what variations in those particular diseases, which more especially belong to infant age,* this reduction is explained—and how the general amount of mortality in the adult, during this period, seems to have been affected by it—which inquiry will show how far this saving of infant lives has been a positive gain to population, and will also confirm, or limit, or refute the proposition of Malthus.

On collating the London Mortuary Tables for those several periods, it appears that the following infantile diseases have fallen in mortality, and are on the decline.

TABLE I.

DISEASE.	Number from 1795 to 1800.	Number from 1820 to 1825.	Difference of the Numbers or Declination.	
Convulsions	24,329	17,074	7,255 *(a)*	TOTAL 14,292
Small Pox	10,867	4,702	6,165 *(b)*	
Teething	2,334	1,462	872 *(c)*	

a This decline nearly equals one-third of its former total mortality!

b Decline equals one-half of its former total mortality.

c The decline is one-third of its former total mortality in six years!

* Infancy comprises all persons below two years of age.

The table of the number of deaths at particular ages evinces, however, that the actual saving of infant lives during this latter period was below four thousand; whence it is manifest that some other infantile diseases must have greatly risen in mortality in the interval of those periods. These are exhibited in the following table.

TABLE II.

DISEASE.	Number from 1795 to 1800.	Number from 1820 to 1825.	Difference or increase.	
Croup	97	586	489	TOTAL 8373 (b)
Hooping Cough	2463	4011	1548	
Water in the Brain (a)	444	3029	2585	
Measles	1671	4261	2590	
Still-born	3418	4579	1161	

Had the diseases enumerated in the first table not fallen in mortality, and had the measles &c. in the second table assumed their present rate of destruction, the deaths among infants had

a It is more than probable that many cases of this class of disease may in the preceding table have been confounded with *convulsions*; but the results which these tables are adduced to exhibit are not affected by this error, inasmuch as on *combining these two classes*, in the several periods, there is a disparity of nearly five thousand—shewing incontestibly a saving of infants in the recent period.

b The total amount of the deaths which are comprised in these two tables, during the former period being 45,628, and during the latter period 39,704, and the actual deaths below two years being in the former period 35,925, in the latter 32,439; there are at least 9698 cases of these disorders in the first instance, and 7265 in the second, which must have occurred after infancy, and consequently are to be transferred to the subsequent tables.—Vide note* p. 125.

now been 49417 (a) out of a total mortality on all ages of 116514, in the course of the six recent years, instead of 32439—or there had been an augmentation in the infant mortality of 104 (b) millions in an entire generation.—Had the former class on the contrary, fallen, and the latter received no increase, the mortality would have been only 27,913 in this period:—that is, there would have been a saving of infant lives equivalent to 34 (c) millions in a generation. Such vast elements are these diseases in the powers which are destined for the repression of human life!

There is a difference in the grand totals of the last columns of the above tables of 5919; while the actual saving of infant lives, during the recent period, is shewn in the BILLS to be only 3486: there are consequently 2433 deaths to be transferred from the total of decline in table I. (which has been assumed to consist for the most part of deaths in *infants*) to the class of adults' diseases in the subsequent table.

What then are the variations in those diseases which prevail for the most part among adults?

The diseases among ADULTS, (d) which have recently *fallen* in mortality.

a That is, on the assumption that all the numbers in these tables consist of infants; but as from note *b* p. 121, some of the cases were *adults*, the actual deaths in infants would be about 45,000; and the ratio of augmented mortality 55 millions in a generation.

b This is obtained by multiplying 7724, the proportion of 116,514, to 900,000,000 by 13,492, which is the difference of 49,417 and 35,925.

c The product—namely, of 4526, which is the difference of 32,439 and 27,913, into the proportion of the mortality of the London bills to the general mortality of the world; this saving however would happen not in six years, but in thirty years—the supposed average period of the existence of a race of mankind.

d This term is used in contradistinction to *infants*, and designates all above the age of two years.

TABLE III.

DISEASE.	Number from 1795 to 1800.	Number from 1820 to 1825.	Difference or decrease in Six recent years.	
Consumption (*a*)	29,864	26,260	3604	Total............ 10,466
Dropsy	5249	4785	464	
Colic, Diarrhœa, Worms	184	155	29	
Fevers	11,274	5829	5445	
Gout	646	198	448	
Jaundice, and Pleurisy	511	377	134	
Mortification (*b*)	1407	1224	183	
Venereal, Stone and Sore-throat	367	208	159	

To this total, the addition of 2433 deaths from the diseases in Table I, (which is the difference in the numbers of small-pox and convulsions, during the two periods, which must have occurred after infancy,) makes the true decrease in the diseases of adults, to be 12,899 in the course of the six recent years.

The diseases among ADULTS, which have recently *risen* in mortality.

a This term, it has been supposed, comprises various ill-defined cases of *decline*, from long internal diseases, and therefore is not to be taken as a criterion of the mortality from *phthisis or pulmonary consumption*; but the author has ascertained from the observations of several physicians, that the deaths from diseases of the *lungs* taken together, are quite equal to the proportion herein assigned.

b Many of this number may have been cases of *supposed* internal mortification; yet it is probable that the greater part consists of external gangrene, which is very prevalent in the overgrown poor-houses of the metropolis.

TABLE IV.

DISEASE.	Number from 1795 to 1800.	Number from 1820 to 1825.	Difference or increase in late years
Abscess	185	548	363
Apoplexy	1384	1672	288
Aged	8155	12,159	4004
Asthma and Palpitation	3723	4539	816
Cancer	365	516	151
Epilepsy and Spasm	20	396	376
Erysipelas and Eruptive disorders	11	151	140
Liver grown, and Stoppage of Stomach *(a)*	27	102	75
Hœmorrhage, and Abortion	116	195	79
Inflammations *(b)*	2633	10,367	7734
Hepatitis, or Inflammation of the Liver *(c)*		540	540
Insanity and Palsy	1185	2024	839
Rheumatism	22	72	50
Scrofula	29	65	36
Thrush	274	462	188
Sudden death *(d)*		1018	1018
Hernia or Ruptures	106	191	85
Dropsy in Chest *(e)*		465	465
Child-bed	981	1188	207

Total.......................... 17,454 *(f)*

On deducting from this total of increase, the total of decrease in the former table there remain 4555, which is the *augmented loss of adult lives* in the latter period. But as the casualties are omitted in these two latter tables, a deduction should be made from the above number, which would educe the true difference, 3162, in the amount of adults in the two periods; the total deaths in them being in the early period 80,913; in the later 84,075.*

NOTES TO REFERENCES IN TABLE IV.

a Probably means disease of the stomach and liver, with *change of structure* in these organs—May not these be cases where such was ascertained to be the fact by dissection?

b I suppose to mean inflammatory disorders, both of internal and external parts.

c The cases of this disorder were probably placed among the class above it, in the earlier period; its large increase of late years may be the result of a new nomenclature, introduced from India!—or an ignorant reference of ill defined cases to a wrong source.

d This was in the former period classed with apoplexy.

e Formerly included with general dropsy.

f The author does not defend the terms which are adopted in these bills, nor does he hold the variations in *all* the particular diseases which they exhibit to be strictly correct. In many instances, however, when the disease is certainly and vulgarly known, as *apoplexy*, *fever*, *dropsy*, *convulsions*—the variations, he conceives, may be depended on.

* In some instances, then, it is requisite to *combine* the analogous diseases in these two tables, in order to ascertain the variations of each disorder.—

These variations then, are a demonstration of the existence of a law of mortality, *within certain limits*, as it is propounded by Malthus—that a reduction of the deaths from one disease, is followed by a rise in some other! For while the above tables manifest that some, both in the adult and in the young, have fallen in mortality, they also evince that others have at the same time risen; and a decrease in the deaths among the young, has more or less, been counter-balanced by an increase in the mortality of adults.—The proportion however, in the variations of mortality, is not so exact as absolutely to check the extension of human life, and the growth of population! For it is seen from the very bills of mortality, apart from the registers of the population, that fewer persons now die in infancy than at the close of the last century, and more die "aged!"

The text of Mr. Malthus requires a particular remark on the actual influence of the cow-pock on the general mortality. The decline in the small-pox in the course of six recent years, when compared with six earlier years, is seen in table I. to be 6165; the deaths in all ages from all diseases being 116,760. From which decline alone, were it extended throughout the world, there would result a saving in the infant population of

But this confusion in the bills will not affect the *result* which the argument in the text is founded on—the positive disparity in the amount of those diseases, in the two periods, which, for the most part, occur in the adult. And if it be objected, that many of the diseases in these tables must contain *infants*—it is replied, that the note *b* page 121, which shews that the total of diseases in the *first two tables* surpasses the number of infants deceased in the several periods, as well as the nature of the particular diseases, evinces that no deduction is to be made on this account which can affect the argument. Moreover, the total amount of the diseases in these two latter tables combined with the numbers stated in the note, p. 121, are in the first period 78,386, and in the recent period 82,941;—the difference of which numbers is also 4555, thus verifying the text, p. 125.

nearly forty-eight millions, in an entire generation of nine hundred millions! And as these require thirty years, in order to be swept away by death, there would be co-existing in any present year, on the whole face of the globe, one million five hundred thousand infants more than in any year at the close of the last century; supposing the marriages and births to be only as numerous now as then. And even this vast reduction in mortality does not comprehend the whole extent of the *saving powers of the cow-pock*, for the decline in the fatality of convulsions also, is truly owing to the partial extinction (would to God it could be said the complete extirpation!) of the small-pox, which are often fatal in the stage of their eruption under that form. So vast *would have been the gain to population, had other infantile diseases remained at the same rate of mortality as they formerly evinced.*

The authority of truth, however, compels me to do homage to the prophetic acumen of Malthus; and forbids me to assent to the calculation of a French Philosopher, who states that twenty-five millions in a generation have *actually been saved* to population, or what is equivalent, that three years have been added to the value of life, by vaccination.—The enlargement of other channels of mortality has operated as a compensating check on the multiplication of infant lives. The infant population has indeed gained a vast accession, as well by a diminution of mortal diseases, as by an increase in the marriages and births. Fewer infants have perished in the later period of six years, as compared with the earlier period, in the rate of twenty-seven millions in a generation:—the preservation of the majority of whom is truly to be ascribed to the depression of the mortality from the small-pox, and from convulsions as connected with it. But the gain by this portion of the community has been met by a greater loss of adult lives; in whom mortality (as it regards the relative amount of deaths from particular diseases in equal remote periods, but *not in* *reference to the existing population,)* has risen in nearly an equal ratio to the decrease of deaths in the young!*

It will next be interesting to inquire how far the variations in the mortality of diseases at Plymouth correspond with the London variations, during the periods before stated. These variations are obtained from the register of the Public Dispensary, for the years 1799 to 1805, and for 1824 to 1826, inclusive, with that of the Author's practice during this latter period. The total mortality in the former period was 321; and in the latter, 285. The deductions from so limited a scale are only presumptively true, yet they form a useful nucleus for future observations.

TABLE V.

DISEASE.	Mortality from 1799 to 1805.		Mortality from 1822 to 1827.	
	Positive Numbers	Ratio to General Mortality.	Positive Numbers	Ratio to General Mortality.
Anasarca or General external Dropsy.	9	1 : 36	9	1 : 31 . 6
Ascites, or Dropsy in the Belly	4	1 ; 80	12	1 : 23 . 7
Asthma, or Disordered Respiration.	I	1 : 321	13	1 : 22
Apoplexy.	10	1 : 32	9	1 : 31 . 7

* This ratio truly expresses the saving of infant life within the sphere of the London bills, and *in so far* as these bills represent the variations in the relative mortality of the young and the adult in other parts of the kingdom, or of the globe, the several ratios in the above tables are an accurate criterion of the present increased value of infant life, and of the variations in the relative mortality of particular diseases, in the British empire, and in the world at large. The completion of this topic requires and amply merits the observation of physicians in various parts of the globe.

TABLE V. CONTINUED.

DISEASE.	Mortality from 1799 to 1805.		Mortality from 1828 to 1837.	
	Positive Numbers	Ratio to General Mortality.	Positive Numbers	Ratio to General Mortality.
Catarrh, or Cold in the Lungs			3	1 : 95
Cholera, Diarrhœa, and Dysentery	10	1 : 32	19	1 : 15
Dyspepsia, or Indigestion			2	1 : 142
Cancer			5	1 : 57
Carditis, or Diseased Heart			7	1 : 40.7
Convulsio	3	1 : 107	10	1 : 28
Cynanche Trachœalis, and Laryngea, or Stridulous Sore Throat, and Loss of Voice	1	1 : 321	6	1 : 47.5
Erysipelas			3	1 : 95
Febris	56	1 : 5.7	19	1 : 15
Enteritis, or Inflammation in the Intestines	1	1 : 321	22	1 : 16
Gastritis, or Inflammation in the Stomach			6	1 : 47
Hydrothorax, or Dropsy in the Chest	4	1 : 80	7	1 : 40.7
Hæmoptoe, or Spitting of Blood from the Lungs	2		1	

TABLE V. CONTINUED.

DISEASE.	Mortality from 1799 to 1805.		Mortality from 1828 to 1827.	
	Positive Numbers	Ratio to General Mortality.	Positive Numbers	Ratio to General Mortality.
Marcor, or Decline.	9	1 : 36	9	1 : 32
Morbilli, or Measles	6	1 : 53,5	11	1 : 26
Pertussis, or Hooping Cough	9	1 : 36	5	1 : 57
Pneumonia, Pleuritis, and Dyspnœa, or Diseased Lungs from Inflammation	38	1 : 8.5	53	1 : 5.4
Phthisis, or Consumption	75	1 : 4.3	50	1 : 5.7
Phrenitis and Hydrocephalus, or Inflammation, with Water in the Brain	4	1 : 80	23	1 : 12.4
Peritonitis, or Inflammation in the Belly.			8	1 : 35.6

The diseases whose positive or absolute mortality is presumed to have *risen* in Plymouth, of late years, are *anasarca* and *ascites, asthma, pneumonia, catarrh, water in the chest, apoplexy, diarrhœa, and cholera, diseases of the stomach and heart, cancer, convulsions, croup, erysipelas, inflammations generally, mesenteric disease, or decline in children, measles, and phrensy fever.* Those which have *fallen*, are *fevers, hooping cough, consumption, and the small-pox.*

From these columns it appears that the following diseases are *accordant* in their variations here and in London:—*phthisis, variola, febris, pneumonia and inflammations in general, hydrothorax, asthma and dyspnœa, apoplexia, catarrh, diseases of* *the heart, and sudden death, dyspepsia, erysipelas, measles, scarlatina, tabes mesenterica, and scrofula, the croup, and cancer.* A few diseases are discordant:—*ascites, diarrhœa, cholera, convulsions, pertussis.* The rise of convulsions and diarrhœa here, is in part connected with the great spread of the *small-pox* and the *measles* in this town during the last few years. Plymouth is, however, at all times peculiarly prolific in *bowel complaints.*

The principle which I proposed to illustrate, is, then, amply confirmed by the variations in particular mortal diseases as they were incident on all ages indiscriminately.—There is another mode in which the constancy of mortality is manifested, namely, in the equalised distribution of death over different ages at various periods—collating distant periods of life without distinguishing the particular mortal disease.—In whatever period mortality falls lighter on some certain ages, it is found to fall heavier on other ages in that period; and if at a subsequent period it is lessened on these latter ages, it is increased on the ages where before it was lighter! So that whenever death is more prevalent in the young, the effect of this on population is *compensated* by the life of the adult being prolonged;—fewer deaths then happen in middle life; more persons survive to old age! A saving of the infant, on the contrary, is at the expense of the adult;—a reduced loss of adults is at the expense of infant life—and so regularly is this constancy of mortality sustained by a corresponding rise and fall in the various means of death, that it is to be deemed A LAW—a fixed rule of action—the course of Nature—the plan of Divine Providence.*

* It should be remembered that this principle of balance or compensation is affirmed to be true only in reference to the *relative proportion of particular mortal diseases among each other;* and that this law of mortality is not so absolute as to maintain an equal and invariable amount of deaths in reference to the existing population, at certain different periods.

In order to illustrate with some precision the equalisation in the allotment of death in various ages, I have formed a table from the London bills, which exhibits the proportion of deaths in given portions of life to the general mortality, during the following periods of time:

TABLE VI.

AGE.	Periods of Time—London Bills 1809-10-11.	1820-21-22.	1823-24-25.	Plymouth Bills for the latter period. St. Andrew	Charles	combined.
Below 2 yrs.	1:3.34	1:4.008	1:3.29	1:2.85	1:2.[illegible]6	1:2.68
From 2 to 5	1:8.77	1:9.4	1:10.10	1:8.8	1:6.5	1:7.7
— 5 to 10	1:23.8	1:20.07	1:26.68	1:21.19	1:19.4	1:20.7
—10 to 20	1:29.19	1:28.12	1:25.8	1:21.64	1:30	1:24.5
—20 to 30	1:15.2	1:13.04	1:14.8	1:16.14	1:26.7	1:19.3
—30 to 40	1:10.66	1:9.89	1:12.6	1:12.7	1:24.8	1:16
—40 to 50	1:9.98	1:9.32	1:11.16	1:15.14	1:22.5	1:17.8
—50 to 60	1:11.9	1:9.80	1:11.41	1:15.1	1:18.[illegible]	1:14.[illegible]
—60 to 70	1:12.9	1:9.41	1:11.53	1:15.1	1:12.4	1:1[illegible]
—70 to 80	1:15.59	1:13.79	1:13.[illegible]3	1:12.5	1:15.3	1:13.6
—80 to 90	1:41.1	1:25.87	1:45.8	1:28.2	1:40	1:39.6

On collating some four of these sections, for example, two of childhood with two of manhood, we find that in the first period mortality was higher in the young, and lower in the adults—in the next, it was higher in the adult, and lower in the young,—in the last period also it was high in the child, and very low in the aged.

Death never falls comparatively lighter or heavier on all ages at the same time: immunity in one age is counterbalanced, as to population, by a heavier load of mortality on another. So admirably equal is the infliction of death on the various periods of human life throughout a given series of years.

On comparing the mortality at Plymouth and London during the last of the above periods, we remark that fewer deaths occurred here in the age from 40 to 50—the ratio being as 1 in 17.8 (Plymouth,) is to 1 in 11.16, (London.) Whereas in infancy more died here, relatively to the total mortality, than in London; as 1 in 2.68 is to 1 in 3.29. This is an awful fact! as LONDON has always been regarded as, pre-eminently, *the sepulchre of the young*. The very high mortality of infants in this district was then owing to the frightful ravages of the measles and the small-pox.

Thus far we have illustrated the constancy of the reign of death.—I shall next display its EQUALISATION among various ages and sexes.

The Sovereign Arbiter of human life and death *compensates* to society for the greater severity of disease and death in one age and sex, at a particular period, by the then comparative immunity of another age and sex from their ravages. The system of compensation and check, in the relative proportion of mortal diseases, is as marked and regular as the law of their constancy.

This equalisation is exhibited—First, in that a rise in the relative mortality and frequency of diseases is *not in the same ratio.*

In order to elucidate this position, I institute a comparison betwixt Dr. Woollcombe's Register of Diseases and Deaths, for seven years, from 1799 to 1805, which comprises 4409 cases of disease and 321 deaths, and a register formed by combining the Dispensary practice for three late years, comprising 2390 cases of disease and 112 deaths, with that of my private practice during the last four years, which contains 3282 cases and 173 deaths; the combined register therefore includes 5672 instances of disease, and 285 deaths. The following conclusions, being formed from a scale of 10,081 cases of disease, and 606 deaths, may deserve some confidence.

TABLE VII.

Exhibiting the variations of the principal fatal diseases in this town in relative frequency and mortality, for the before assigned periods.

DISEASE.	Frequency in Positive Numbers.		Mortality in Positive Numbers.		Relative Frequency to aggregate of Disease.		Relative Mortality, or Number of Deceased to the Sick.	
	1799. 1805.	1823. 1827.	1799. 1805.	1823. 1827.	1799. 1805.	1823. 1827.	1799. 1805.	1823. 1827.
1. Asthma, Dyspnœa, Pneumonia, Catarrhus	572	946	40	69	1:7.7	1:6	1:14.5	1:13.7
2. Phthisis	198	137	75	50	1:22.3	1:41.4	1:2.7	1:2.5
3. Hæmoptysis	27	39	2	1	1:163	1:145.4	1:13.5	1:39
4. Hydrothorax	10	15	4	7	1:440.9	1:378	1:2.5	1:2.14
5. Pertussis	60	31	9	5	1:73.4	1:183	1:6.6	1:6.2

TABLE VII. CONTINUED.

DISEASE.	Frequency in Positive Numbers. 1799. 1805.	1823. 1827.	Mortality in Positive Numbers, 1799. 1805.	1823. 1827.	Relative Frequency to Aggregate of Disease. 1790. 1805.	1823. 1827.	Relative Mortality, or Number of Deceased to the Sick. 1799. 1805.	1823. 1827.
6. Morbilli	71	88	6	11	1 : 62	1 : 64.5	1 : 12	1 : 8
7. Apoplexia	12	17	10	9	1:367.4	1 :334	1:1.2	1 : 2
8. Convulsio	9	35	8	10	1:488.8	1 : 162	1 : 3	1 : 3.5
9. Phrenitis, and Hydrocephalus	9	108	4	20	1:488.8	1 : 52.5	1 : 2.25	1 : 5.4
Anasarca, Ascites	112	87	13	21	1 : 39	1 : 65.2	1 : 9	1 : 4
Erysipelas	11	30		3	1:400.8	1:189.6	0 : 11	1 : 10
Diarrhœa, Cholera, Dysenteria	304	385	10	19	1 : 14.5	1 : 14.7	1 : 30.4	1:20.3
Colica, Constipatio	60	131	1	2	1 : 73.5	1 : 43.3	1 : 60	1 : 65.5
Tabes Mesenterica	31	32	9	6	1:142.2	1 : 177	1 : 3.4	1 : 5.3
Peritonitis, Enteritis	2	237	1	30	1: 2204	1 : 24	1 : 2	1 : 7.9
Variola	112	37	46	9	1 : 39	1 : 154	1 : 2.4	1 : 4.1
Scarlatina	68	21	5	1	1 : 69.6	1 : 270	1: 12.6	1 : 21
Febris	487	400	56	19	1 : 9	1 : 14.8	1 : 9.74	1 : 20.1

TABLE VII. CONTINUED.

DISEASE.	Frequency in Positive Numbers.		Mortality in Positive Numbers.		Relative Frequency to Aggregate of Disease.		Relative Mortality, or number of Deceased to the Sick.	
	1799. 1805.	1823. 1827.	1799. 1805.	1823. 1827.	1799. 1805.	1823. 1827.	1790. 1805.	1823. 1827.
Diseases of Lungs of 1, 2, 3, 4,	807	1137	121	127	1 : 5 . 4	1 : 5	1:6.6	1:8.9
Brain, of 7, 8, 9, with Chorea, Epilepsy, Palsy, Mania	164	531	18	40	1:26.9	1:10.6	1 : 9	1 13.2
Heart	6	48	1	7	1:735	1:118	1:6	1:7
Skin, &c.	444	541	58	25	1 : 9.9	1:10.5	1:7.65	1:21.6
Stomach	261	607		25	1:17	1:9.3	0:261	1:24.3
Intestines	492	827	27	57	1:8.9	1:6.8	1:18.3	1:14.5

A comparison of these columns shews that of late years in this town diseases of the *lungs*, of the *brain*, and of the *heart*, hæmoptoe, apoplexy, convulsions, water in the brain, colic and inflammations in the intestines, *have risen in frequency but fallen in relative mortality*; whereas, *phthisis*, *measles*, *dropsy*, *diarrhœa*, *cholera and dysentery* taken together, and *pertussis*, *have fallen in frequency and risen in mortality*. Some diseases, on the other hand, have risen both in frequency and relative mortality;—for example, inflammations in the lungs, hydrothorax, ascites, cholera, dyspepsia, erysipelas, and diseases of the stomach and intestines; while tabes mesenterica, fever, the small-pox, scarlatina, and diseases of the skin taken together, have fallen in frequency and mortality!

Secondly, the equalisation in the reign of disease and death, is evinced in the *difference of the rate* as to frequency and mortality in which diseases are incident on various ages and sexes.

First, as it respects the reign of disease and death in the SEXES;—the greater prevalency of a disease in one sex, is compensated by its having a smaller relative mortality than in the other sex, which is found to be less liable to that disease.

TABLE VIII.

DISEASES.	*Total in both sexes* OF		PROPORTION IN MALE OF		PROPORTION IN FEMALE OF	
	Disease.	Deaths.	Disease.	Deaths.	Disease.	Deaths.
Ascites, Anasarca	88	21	22	8	66	13
Carditis	48	7	30	4	18	3
Cholera	88	5	34	4	51	1
Diarrhœa	268	13	150	7	118	6
Enteritis	138	22	60	12	78	10
Phrenitis, Hydrocephalus	110	25	60	13	50	12
Morbilli	88	11	54	4	34	7
Peripneumonia	496	45	235	28	261	17
Peritonitis	99	8	24	3	75	5
Pleuritis, Pleurodyne	112	8	42	4	70	4

TABLE VIII. CONTINUED.

DISEASES.	*Total in both sexes* OF Disease.	Deaths.	PROPORTION IN MALE OF Disease.	Deaths.	PROPORTION IN FEMALE OF Disease.	Deaths.
Febris	402	19	166	9	236	10
Marasmus	59	9	24	6	35	3
Diseases of the Lungs	1119	125	503	61	616	64
Stomach	589	7	151	3	438	4
Intestines	518	37	250	19	268	18
Brain *	264	34	132	17	132	17

* The addition of Innocuous Headache, which is far more prevalent in the female, would make the apparent exception in the last section accord with the principle.

Some of the above numbers do not correspond with those in the preceding table, as the distinction of sex was not noted in many of the unimportant cases contained in that table.

Secondly, the same principle obtains in the allotment of diseases and their mortality as it respects different *ages*;—a disease has not the greatest tendency to a mortal issue in the age which is most liable to that disease.—A novel and important fact.

TABLE IX.

DISEASE.	MOST DISEASED AGE.	NUMBER OF Sick.	NUMBER OF Deaths.	MOST RELATIVELY MORTAL AGE.	NUMBER OF Sick.	NUMBER OF Deaths.
Anasarca, Ascites	From 20 to 30	16	4	From 40 to 50	14	5
Pneumonia, Asthma, Catarrh	OF CHILDHOOD. The First 5 years the first ten From 30 to 40	 208 232 120	 30 30 5	The first year and first ten years	86	13
Carditis	From 40 to 50	13	2	From 30 to 40	9	2
Apoplexia	From 50 to 60	4	2	From 40 to 50	3	2
Convulsio	First year	11	6	From 2 to 5	5	3
Cholera	First year First ten years	16 27	1 1	First year From 40 to 50	16 17	1 1
Diarrhœa	First ten ... Second year From 30 to 40	171 71 27	10 2 2	First ten From 2 to 5	171 29	10 4
Erysipelas	From 30 to 40	7	1	From 20 to 30	6	1
Dyspepsia	Ditto	113	0	... 50 to 60	49	1
Enteritis	From 2 to 5 First ten	27 72	5 12	First year From 10 to 20	8 8	3 3
Gastritis	From 20 to 30	35	1	From 60 to 70	14	2
Hepatitis, Icterus	From 20 to 30	34	0	From 50 to 60	9	2
Morbilli	From 2 to 5	34	2	First year	9	3
Pleuritis, Pleurodyne	From 20 to 30	40	2	From 40 to 50	13	1
Phthisis	From 30 to 40	45	16	From 40 to 50	25	13

TABLE IX. CONTINUED.

DISEASES.	MOST DISEASED AGE.	NUMBER OF Sick.	Deaths.	MOST RELATIVELY MORTAL AGE.	NUMBER OF Sick.	Deaths.
Peritonitis	From 30 to 40	33	2	From 50 to 60	4	1
Phrenitis Hydrocephalus }	From 2 to 5 first five first ten	17 37 54	6 7 10	From 2 to 5 ... 5 to 10 ... 30 to 40 ... 40 to 50	17 17 7 2	6 3 3 2
Pertussis	From 2 to 5	12	3	Second year	3	1
Rheumatism	From 30 to 40	64	0	From 40 to 50	41	1
Febris	First ten years From 10 to 20 ... 20 to 30	116 93 78	2 7 6	From 15 to 20 ... 20 to 30 ... 30 to 40	51 78 54	5 6 3
Diseases of Lungs	First year first ten From 30—40	92 277 207	14 34 22	Second year ... 40 to 50	81 148	14 20
Stomach	From 30 to 40	134		First ten From 60 to 70	60 40	3 2
Intestines	Second year First ten From 30 to 40	95 273 62	5 23 3	First year From 2 to 5 ... 10 to 20	84 58 43	7 9 3
Brain	From 2 to 5 First ten ... 30 to 40	26 95 41	4 17 3	First year From 40 to 50 ... 50 to 60	23 28 13	6 5 4

It may be remarked that I have not taken equal periods of time in the several ages for comparison, but what are presumed to be equal *proportional ages* in respect of their liability to disease:—the first year, the second, the next three, the next five, and all subsequent tens, may be supposed to be nearly equal as to the susceptibility of the body for assuming, or as to its powers of resisting disease.

Thirdly, the equalisation of mortality is shewn in that, if in any period there is an increase of deaths in a certain age, there is a proportionate decrease in that age at a subsequent period!

In the parish of St. Andrew, for example, the rate of deaths in infants to the whole mortality, was in the years

1823-24—in	24-25—in	25-26—in	26-27.
As 1:3	1:2.76	1:2.96	1:3.8.

Now by the London bills it appears that the average rate of deaths in infants to the general mortality is 1:3.44 or 1:3.28. So that whereas the rate of infant mortality here in 1824-1825 and in 1825-26 surpassed that of London, in the following year it was reduced below it; *an extraordinary loss in the former years being compensated in the latter by an extraordinary preservation!*

The THIRD PART of my subject is an enquiry into the CAUSES of this constancy of mortality; what explication can be assigned for the variation in mortal diseases?

In the tables of those cognate diseases which have severally risen or fallen in mortality at the present period, we remark an order of anomalies, and an order of harmonies. Those I term *cognate*, or kindred diseases, which possess a natural affinity, as being situated in the same part of the body, or as possessing a similarity in their pre-disposing and exciting causes.

First, of the anomalous variations, or those which are in opposition to that natural affinity above described,—I offer examples in the rise of apoplexy, palsy, insanity and epilepsy, with the fall of convulsions—the rise of asthma and scrofula, with the fall in consumption—the rise of water in the brain, with the fall in convulsions—the rise of water in the chest, with the fall in consumption—the rise in diseases of the stomach, with the fall in the gout and stone—the rise of inflammations, with the fall of fevers—the rise of hepatitis, with the fall of jaundice—the rise of the thrush, with the fall in teething and diarrhœa.

Second, of harmonious variations we have examples in the concurrent *increase* of apoplexy, insanity, palsy, and spasm—of death in childbed, and of abdominal inflammations—of diseases of the stomach, head and heart, with sudden death—of rheumatism, inflammations, and bleedings—of scrofula, insanity, hooping cough, and water in the brain—of hydrothorax, inflammations, and croup—of cancer, and diseases of the stomach. Again, in the *decline* of the mortality from jaundice and gout—scarlatina and sore throat—fevers and mortification—teething and diarrhœa—convulsions and small-pox. Lastly, in the *increase* of deaths termed 'aged,' with the decline in mortification, stone, dysentery, and gout—in the increase of inflammations, with the decline in mortification and the dropsy.

Whatever variations admit of solution by natural causes, can be referred only to three circumstances:—first, to changes in public manners; secondly, to vicissitudes of climate; or thirdly, to revolutions in the science and art of medicine.

To the *first* we might refer the variations in gout, apoplexy, insanity, and sudden death. The prevailing character of the last age was *sensual;* in the present, a devotion to the voluptuous passions of the *mind*, more particularly, that fascinating desire of personal aggrandisement which pervades all classes of society, has supplanted the gratification of the grosser appetites of man's animal nature; and where the latter had slain its thousands, the former has slain its tens of thousands!

Can we ascribe the variations in fevers, inflammations, measles, hooping cough, &c. to changes in the seasons, combined with changes of general manners; or, what is the same in effect, to changes in our modes and means of obviating the vicissitudes of climate? For the increase in the class of infantile disorders some philosophers have assigned the circumstance of the decline in the small-pox having left more infants surviving to become their victims. It is a curious fact, that the whole number who appear from the London bills to have died of the croup, of water in the brain, of hooping cough and measles, in the later period above defined, nearly equals those whom the small-pox, convulsions, and teething had failed to carry off!

Thirdly, revolutions in medicine may have effected the rise in the *designations* of chronic pneumonia, and the fall in consumption—the rise in abdominal inflammations, and the fall of dropsy in the belly—the *new creation* in the London bills of *hepatitis*, and of hydrothorax—the rise of abscess, and the fall of mortifications. Some of these changes are explained by the supposition of different names being assigned at different periods to the same disease—the variation being nominal only; others express a positive rise or fall, and thus exemplify the triumphs of the present advanced powers of medicine.

The variation in *inflammations* merits a particular remark, they being stated in the BILLS to be quadrupled in the course of the last six years. This I refer in part to a change in the medical distinctions and designations of disease; partly also to an alteration in the condition and habits of the people, who now have better food and habitations than formerly, and therefore are less disposed to diseases of debility; partly, however, to a law of Divine Providence, by which a general decline in co-incident mortal diseases is not permitted.

It is pleasing to remark how much more smoothly the stream of mortality has been flowing in late years. At the present time the annual bills seldom show a disparity of more than twelve hundred deaths, whereas at the beginning of the century we find a variation from ONE TO SIX THOUSAND; such a serious disparity must have severely deranged the course of social life. The present equality of death is owing to the check which a general improvement in the manners and condition of the nation, the advanced state of medicine, and the merciful "*fiat*" of Divine Providence, have placed on *pestilential fevers*, and the *small-pox*.

Many of the foregoing variations admit of easy and natural explication; in others we do not discern a natural causation. Epidemic diseases, such as fevers, measles, and hooping cough, prevail at particular seasons only, and with unequal rates of mortality, and having run their course decline and expire. Why they are not at all times equally prevalent is a mystery; they come without human anticipation, and at times repel the best directed efforts of human skill. Is it unphilosophical to resolve their revolutions into the good pleasure of the Almighty, who saith, "Thus far shall ye go, and no farther";—who "taketh away the breath of man and he dies." The political economist sees only one cause of the greater mortality of certain diseases when some others are confined within narrower channels, "The damming up a necessary outlet of mortality, which engenders poverty,"—which issues in disease and death. It cannot be questioned that the proportion of the means of subsistence to the necessities of a people will ultimately regulate their general well-being; but no political necessity for death can *regulate the channels of mortality*, or maintain such a disparity betwixt the means of life and the existing population, as is requisite to generate poverty and mortal maladies. Certain epidemics may have had for their precursors an unusual scarcity of provisions, or a state of deep public calamity; there are, however, unquestionably, many adult as well as infantile diseases whose rise and fall cannot be traced to any previous abundance or poverty of the means of subsistence, nor to an extraordinary course of the seasons. If such a principle as "the plan of Divine Providence respecting human life and death" be not admitted, might we not expect that those causes which tend to elevate or depress a disease as to its frequency should *similarly affect its rate of mortality*?—That this is not the fact has been demonstrated.

The female is far more the subject of disease than the male, while he is more exposed than she is to some diseases of high mortality; yet the numbers of each sex who die annually are singularly equal!

If then the prevalence of disease and death be the inevitable allotment of a supernatural power is the art of medicine nugatory?—By no means: the arrangements of Divine Providence have established an infallible connexion betwixt certain means and their ends; and the moral relations of man enjoin the exertion of his powers for self-preservation. None of the general laws of nature exclude particular exceptions. Human efforts may not greatly lessen the aggregate of mortality, nor extirpate nor diminish any one mortal disease without a consequent rise in some other; they can however *alter the seat of its distribution*, confine the range of a violent and agonising disorder, and thus favour the rise of a milder substitute;—they can open numerous chances of life to individual sufferers, extend its value in the aggregate, and mightily influence the whole condition of society.

One cannot but admire the merciful wisdom which *variations* in the means of death display:—the load of suffering is thus not permitted constantly to fall on the same age and sex, but is distributed by a rule of compensation and equality over the whole range of human life. The law, moreover, which by the constant reign of mortal diseases forbids the majority of mankind to attain to a late old age, is the means of maintaining a rapid succession of living beings, and of conducing to the youth and vigour of the world's population. Should death cease from a land, in the present constitution of the world, while the propagation of mankind is unchecked, misery and poverty would rapidly increase in an awful proportion. The extinction of the few becomes a means of the greater well-being of the many who survive.

A survey of the positive ratio in which mortality is incident on various ages discovers a system equally benignant.—In infancy nearly a *third* of mankind die—in early childhood, from the age of two to five years, a *ninth*—in the second stage of childhood, or from five to ten years of age, only a *twenty-third*—in youth, from ten to twenty years, a *twenty-seventh*—in early manhood, or from twenty to thirty, a *fourteenth*—in middle or mature manhood, from thirty to forty, a *tenth*—in late manhood, from forty to fifty, a *ninth*—in early old age, from fifty to sixty, more than a *tenth*—in middle old age, from sixty to seventy, not an *eleventh*—in late old age, one *twenty-sixth*.

In the first twenty years of life the proportion of deaths to the general mortality is 1 : 2.12 ; in the next twenty, it is 1 : 6.3; in the third twenty years, 1 : 16.7!*

Herein are the vestiges of an admirable protecting Providence, which offers to the hand of death in larger numbers the least useful and least expensive members of the population, at a period when fewer relations and more confined faculties make the connexion of those devoted ones with the living world less indispensable, and therefore their loss more tolerable; at a period, too, when their departure hence is a certain pledge of their passage to a better state, while the more necessary and precious members of the community are sheltered from the mortal dart.

The aspect of death as a Hydra, the excision of one of whose heads is instantly succeeded by a new one, is awfully impressive. Yet the contemplation of mortality as regulated

* This estimate is derived from the London bills for nine years; how far it expresses the relative mortality of these portions of life in the general population, the author has no means of ascertaining.

by a determinate controlling Providence whose administration is equal and kind, beneath which the fortunes of men are so connected and *compensated* that the decease of one person augments the chances of life for another, greatly mitigates the sad impression from the constancy of the reign of death; and it should strengthen man's acquiescence in his destiny by its appeal to the sentiment of *patriotism* as well as of religion. The GENIUS OF MEDICINE himself cannot dry up the bitter waters of mortality: the mortal poison is being endlessly changed with every change of age and season. This constancy amid mutation should teach man that he lives by the will of a Supreme Power; it should become to him an unceasing stimulus to mutual succour, as it creates inexhaustible scope for his sympathy; it should place a potent check on human passions, and supply omnipotent motives to sober living. Death cannot cease to reign coeval with the existence of man in a fallen world: no mortal disease however is invincible, and the hope of arresting human sufferings is unlimited.

Finally, a period and a state are approaching when it shall no more be said,—"*I am sick*:" for "*there shall be no more death!*"

APPENDIX.

A VIEW of the Mortality at Plymouth, which has been obtained from the Register of Burials in the parish of Saint Andrew, for the inspection of which I am indebted to my friend the Reverend John Hatchard; and from that of the Parish of Charles, which Mr. Rickard, the Parish Clerk, has presented to me.

TABLE I.

THE RELATIVE MORTALITY OF THE SEASONS.

SEASON	PARISHES.	1823 Male	1824 Fem.	1824 Male	1825 Fem.	1825 Male	1826 Fem.	1826 Male	1827 Fem.	TOTAL Male		TOTAL Female		Total in both sexes	
Spring	St. Andrew	51	43	42	32	47	47	33	28	173	290	150	274	323	564
	Charles	32	35	25	27	42	36	18	26	117		124		241	
Summer	St. Andrew	32	27	60	42	43	59	37	26	172	307	154	289	326	596
	Charles	24	30	46	40	38	41	26	24	135		135		270	
Autumn	St. Andrew	41	33	42	30	46	51	33	34	162	249	148	240	310	489
	Charles	20	29	20	24	28	15	19	25	87		93		179	
Winter	St. Andrew	38	31	48	41	45	46	31	28	161	271	146	250	307	521
	Charles	24	21	40	31	23	28	21	24	110		104		214	
	Total	262	249	323	267	312	323	218	215	1117		1053		2170	

TABLE II.

The Months placed in the order of their greater Mortality.

MONTHS.	NUMBER OF DEATHS.
June	218
May	204
August	189
July	188
March	186
February	185
January	181
April	174
September	173
October	167
December	156
November	150

TABLE III.

The Mortality of each Quarter of the year during the whole period.

First Quarter	St. Andrew	336	589
	Charles	256	
Second Quarter	St. Andrew	329	596
	Charles	267	
Third Quarter	St. Andrew	321	552
	Charles	231	
Fourth Quarter	St. Andrew	298	468
	Charles	169	
Warm six months	St. Andrew	650	1148
	Charles	498	
Cold six months	St. Andrew	619	1044
	Charles	425	

NOTES ON THE FIRST THREE TABLES.

In autumn and winter, the greatest disparity exists in the mortality of the two parishes. Charles' parish seems peculiarly lenient in the mortality of the cold seasons.

The most mortal season in St. Andrew's is the summer; the least is the winter.

In Charles', the summer is the most mortal; the least so is the autumn.

In winter, the greatest disparity subsists in the mortality of the male and female; in the autumn the least.

In summer is the highest mortality in both sexes; in autumn the least.

In May and June was the maximum of mortality in both sexes; in November and December the least. In February and October there was the greatest disparity in the mortality of the male and female; in September and January the least.

TABLE IV.

The mortality at particular *ages* in both sexes.

AGE.	PARISHES.	1823-1824 Male	1823-1824 Fem.	1824-1825 Male	1824-1825 Fem.	1825-1826 Male	1825-1826 Fem.	1826-1827 Male	1826-1827 Fem.	Total in four years in the Male		Total in four years in the Female		*Total in both sexes.*	
1st year	St. Andrew	50	13	39	24	45	35	33	21	167	269	93	189	260	458
	Charles	27	27	36	28	22	25	17	16	102		96		198	
2nd year	St. Andrew	15	21	35	25	23	28	7	5	80	154	79	131	159	285
	Charles	12	13	27	18	26	13	9	8	74		52		126	
2 to 5	St. Andrew	14	12	23	18	17	31	7	2	61	124	63	127	124	251
	Charles	20	7	17	21	21	26	5	10	63		64		127	
5 to 10	St. Andrew	3	7	8	10	5	14	7	4	23	46	35	59	58	105
	Charles	3	8	6	4	9	7	5	5	23		24		47	
10 to 15	St. Andrew	3	1	3	2	3	3	3	2	12	21	8	17	20	38
	Charles	2	1	2	3	3	3	2	2	9		9		18	
15 to 20	St. Andrew	6	4	10	1	6	5	3	3	25	30	13	21	38	51
	Charles	0	3	2	0	3	2	0	3	5		8		13	
20 to 30	St. Andrew	14	11	10	5	11	12	14	10	49	65	38	61	87	126
	Charles	2	7	6	7	2	3	6	6	16		23		39	
30 to 40	St. Andrew	8	17	15	14	14	12	10	13	47	69	56	77	103	146
	Charles	3	5	3	7	6	5	10	4	22		21		43	

TABLE IV. CONTINUED.

AGE.	PARISHES.	1823-1824 Male	1823-1824 Fem.	1824-1825 Male	1824-1825 Fem.	1825-1826 Male	1825-1826 Fem.	1826-1827 Male	1826-1827 Fem.	TOTAL IN FOUR YEARS in the Male	Sum	TOTAL IN FOUR YEARS in the Female	Sum	Total in both sexes	Sum
40 to 50	St. Andrew	4	7	11	11	18	15	8	7	41	62	40	61	81	123
	Charles	5	9	7	3	5	3	4	6	21		21		42	
50 to 60	St. Andrew	12	13	12	8	10	10	17	9	51	86	40	75	91	161
	Charles	11	11	7	10	8	7	9	7	35		35		70	
60 to 70	St. Andrew	11	11	10	9	14	12	13	11	48	80	43	83	91	163
	Charles	5	13	6	9	13	12	8	6	32		40		72	
70 to 80	St. Andrew	12	18	9	12	14	16	9	15	44	81	61	106	105	187
	Charles	9	7	8	7	9	11	11	20	37		45		82	
80 to 90	St. Andrew	2	6	7	7	5	9	2	13	16	26	35	55	51	83
	Charles.	1	4	5	7	3	4	1	5	10		20		32	
90 to 100	St. Andrew	3	0	1	1	0				4	6	1	6	5	12
	Charles	0	1	0	1	1	3	1		2		5		7	
TOTAL.	St. Andrew	157	141	192	147	185	202	133	115	668	1116	605	1061	1273	2177
	Charles	100	115	131	122	131	120	86	99	448		456		904	
		513		592		638		433							

The first table, when compared with a similar one drawn up by Dr. Woollcombe for the years 1799 to 1804, exhibits a remarkable change to have taken place in the relative mortality of the seasons of late years, in this town. Then, the *winters* were severe, and pre-eminent in mortality; now, they are mild, but the *spring and summer* have been pregnant with fatal epidemics. This accords with, and is explained by, the recent increase in the mortality of particular diseases stated in the essay at Table IX.

The above tables demonstrate that the spring and autumn are relatively more mortal to the female, but the winter and summer to the male sex. The pre-eminent mortality of the *summer season*, and the disparity in the deaths in the *last* and the *first quarters* of the year, as exhibited in Tables I and III, is very remarkable. From Table III the combined mortality of the winter and spring is such as to be exactly equal with that of the summer and autumn; which fact may be supposed to confirm popular opinion on the salubrity of this climate in the cold portion of the year; and encourages the resort of invalids to this part of the kingdom.

What can explain the singular disparity of the deaths in the male and female sex during the period of infancy, as seen in Table IV?

It is deserving of notice, that in the Parish of Charles the mortality in children is relatively greater than in the Parish of St. Andrew; and this fact demonstrates the importance of a *change of situation* among the remedies to be adopted for the diseases of this portion of the community in that part of the town.

NOTE ON TABLE IV.

The ratios given in Table vii of the essay are obtained from this table.

The length of this paper forbids me to extend my remarks on these tables. It is presumed that the above comments may serve to point out the *sort* of interesting information to be derived from the STATISTICS of mortality, and to suggest more copious observations of similar import.

Plymouth, April, 1829.

V.

ON THE CHARACTERS OF ABBOTIA, A NEW GENUS BELONGING TO THE FAMILY HISTERIDÆ, WITH DESCRIPTIONS OF TWO SPECIES; BY WILLIAM ELFORD LEACH, M. D. F. R. S. &c. HONORARY MEMBER OF THE PLYMOUTH INSTITUTION.

ABBOTIA.

CORPUS elongatum, angustum, depressum, thoracis et elytrorum, superficies convexiuscula.

Sternum antice emarginatum.
Mandibula æquales edentulæ
Palpi maxillares setacei
—— labiales filiformes.

Body elongated, narrow, depressed, with the surface of thorax and of the elytra, slightly convex.

Sternum, anteriorly notched
Mandibles equal, toothless.
Maxillary palpi setaceous
Labial palpi filiform.

1. *Abbotia paykulliana.*

A. Corpore toto glaberrimo atro nitente: elytris externe, striis externis perfectis, et duabus interioribus imperfectis, sculptis. Antennis pedibusque piceis; tibiis anticis et mediis trispinosis; posticis uni-spinosis. Longitudo 0003 millimetrorum.

Habitat in Georgia Americæ.

Thorax lateraliter tenue, abdomine, extremitate posteriore fortiter, sternoque lateraliter, tenuiter, punctatum.

A. With the whole body very smooth, jet black shining; with the elytra sculptured externally with two perfect, and with two imperfect striæ; the antennæ and the feet pitch black; with the interior and middle pair of the tibiæ three-spined; the hinder pair one-spined. Length 13¼-12 of an inch.

Inhabits Georgia in America.

Thorax punctulated laterally, slighty; the extremity of the abdomen strongly, and the sternum, laterally, slightly.

2. *Abbotia Georgiana.*

A. Corpore glaberrimo, aterrimo, nitente; elytris striis tribus externis perfectis; et striis tribus internis imperfectis sculptis; tibiis anticis quatuor, mediis tribus, et posticis uni-spinosis. Longitudo 1000 4¼ millemetrorum.

Habitat cum præcedente.

Thorax lateraliter tenuiter abdomine infra et ad apicem posticum fortiter, et sternum lateraliter tenuiter impresso punctatis.

A. With the body very deep jet black, shining; with the elytra sculptured; three external perfect and three internal imperfect striæ; the anterior pair of the tibiæ with four, the middle with three, the hinder pair with one spine. Length $2\frac{1}{4}$-12 of an inch.

Inhabits the same country with the preceding species.

Thorax, laterally slightly, the under part of the hinder part of the abdomen strongly and the sternum laterally slightly sculptured with impressed dots or spots.

I have named this genus in honour of Mr. Abbot, a most industrious collector of insects, and a very celebrated entomological artist.

Both these species are in my collection in the British Museum.

DESCRIPTION OF SOME NEW SPECIES OF THE CLASS MYRIAPODA; BY WILLIAM ELFORD LEACH, M. D. F. R. S. &c. HONORARY MEMBER OF THE PLYMOUTH INSTITUTION.

JULUS.

Julus, *Auctorum.*

Corpus elongatum; segmento ultimo abruptissimo acuminato. Antennæ sex articulatæ capitis pagina superiore insertæ; articulo primo minimo; secundo subconico elongato; tertio paululum breviore, subconico latiore; quarto claviformi; quinto conico; sexto minutissimo cylindrico apice truncato. Pedes mediocres.

Body elongated with the last segment very abruptly acuminated.

Antennæ six jointed, inserted in the upper margin of the head, with the first joint minute; the second subconic elongated; the third a very little shorter, subconic, broader; the fourth club-shaped; the fifth conic; the sixth very minute, cylindric with the apex truncated.

Feet moderately long.

EUOPUS.

Euopus Leach.

Corpus cylindricum elongatum, segmento ultimo integro obtuso. Antennæ septem articulatæ; articulo primo lato; secundo, tertio, quarto, et quinto, fere æqualibus gradatim clavatis; sexto clavato, clava conica, apice truncato; septimo minutissimo conico.

Pedes longissimi.

Body cylindric elongated, with the last segment entire, obtuse.

Antennæ seven jointed, with the first joint broad; the second, third, fourth, and fifth, nearly equal, gradually clubbed; the sixth clubbed; the club conic, with its apex truncated; the seventh very minute conic.

Feet very long.

MYRIAPODA.

1. *Julus trilineatus.*

J. Corpore hyalino olivaceo, brunneo, pallidissimo; segmentis lineolis tenuissimis longitudinalibus; Dorso, linea mediali ferruginea lineaque laterali punctorum nigrorum composita, notato. Capite lineis transversis tribus impressis inter oculos medio latiore; vertice, oris regione, mandibulis, palpisque testaceis pallidis. Oculis atris. Longitudo 2018 millemetrorum.

Habitat sub lapidibus, prope Nice, rarissime.

J. with the body hyaline, very pale olive brown, with the segments sculptured with very fine longitudinal lines. The back marked with one middle ferruginous line, and a lateral line, composed of black spots; the head with three impressed transverse lines between the eyes, the middle one broadest; the vertex, the region of the mouth, the mandibles and the palpi, pale testaceous, the eyes jet black. Length 8-12 of an inch.

Found very rarely under stones, near Nice.

2. *Julus aimatopus.*

J. Corpore cærulescente-nigro segmentis lineolis impresis, longitudinalibus sculptis; lateribus linea longitudinali nigro punctulata azura, lineisque duabus nigris, segmentis infra azuris, antennis, palpis, pedibusque sanguineis pallidissimis, tarsis saturatioribus. Longitudo 0040 millemetrorum.

Habitat in Alpibus maritimis sat frequenter sub lapidibus.

J. With the body blueish black; the segments sculptured with longitudinal impressed lines; the sides with one longitudinal azure line spotted with black, and with two other black lines; the segments, azure; the antennæ, palpi, and feet, very pale blood red; the tarsi deeper coloured. Length 18-12 of an inch.

Found in the Maritime Alps, frequently enough, under stones.

3. *Julus modestus.*

J. Corpore hyalino; dorso purpurascente, lineolis longitudinalibus sculptis, lineis tribus longitudinalibus punctorum atrorum compositis; uno dorsali, aliis lateralibus; lateribus griscis; capite glauco; oculis atris; antennis violascentibus grisco annulatis.

Longitudo 0015 millemetrorum.

Habitat sub lapidibus prope Villa Franca rarissime.

J. With the body hyaline; the back sculptured with very fine longitudinal lines; with three longitudinal lines composed of black spots, one dorsal, the other lateral; sides grey; head glaucous; eyes jet black. Length 11-12 of an inch.

Found very rarely near Villa Franca.

4. *Julus annulatus.*

J. Corpore purpurascente, segmentis postice luteis, lineolis longitudinalibus impressis sculptis; oculis atris; antennis nigris; pedibus violascentibus.

Longitudo 00042 millemetrorum.

Habitat sub lapidibus prope Nice vulgatissimus.

J. With the body purplish, segments behind luteous (clay coloured,) sculptured with longitudinal impressed lines; eyes jet black; antennæ black; feet pale violet. Length 10-12 of an inch.

Found under stones near Nice, very common.

5. *Julus piceus.*

J. corpore piceo glaberrimo nitidissimo; segmentis striolis, tenuissimis longitudinalibus impressis sculptis; antennis piceis; oculis atris; palpis nigrescentibus: pedibus testaceis, unguibus fuscis.

β. Segmentis lateraliler maculis ocraceis pallidissimis, irregularibus pictis.

Longitudo 0050 millemetrorum.

Habitat in Alpibus secondariis, apud peninsulam St. Hospice.

J. with the body pitch black, very smooth and very glossy; segments sculptured with very fine longitudinal impressed lines; the antennæ pitch black; eyes jet black; palpi blackish; feet testaceous; nails fuscous brown.

Length 22-12 of an inch.

Found rarely in the secondary Alps, at the peninsula called St. Hospice.

Euopus Rissonianus.

E. corpore carneo pallido; segmentis omnibus oblique striolatis (striis postice gradatim increscentibus) postice, intense ferrugineis; antennis fuscis; oculis intense ferrugineis: pedibus grisco fuscescentibus; appendiculis masculinis ferrugineo-atris politis glaberrimis nitidissimis.

Longitudo 0053 millemetrorum.

Habitat in Gallia Australi, et in Italia, hortis, nemoribus et sylvis hand infrequenter.

E. with the body flesh-coloured; all the segments obliquely striolated (the striæ gradually increasing behind); behind intensely ferruginous; antennæ fuscous; eyes intensely ferruginous; feet grey inclining to fuscous; the masculine appendices ferruginous; jet-black, polished very smooth, and very glossy.

Length 2 inches.

This interesting species is found not uncommon in gardens, groves, and woods, in the south of France, and in Italy.

SCORPIONIDA.

Chelifer bicolor.

C. Thorace dorsoque olivaceo-brunneis segmentis omnibus postice, olivaceo-viridibus pallidis; abdomine pallidiore; pectore, mandibulis, manibusque intense ferrugineis; pedibus posterioribus ferrugineis pallidis.

Longitudo 0004.

Habitat locis scopulosis prope Nice, rarius.

C. with thorax and back olive-brown; all the segments behind, pale olive-green; abdomen paler; breast, mandibles, and hands intensely ferruginous; hinder feet pale ferruginous. Length 2½-12 of an inch.

Found in rocky places near Nice, very common.

Scorpio rupestris.

S. Manubus, mandibulis, thorace, abdomine, caudaque olivaceo-brunneis; pedibus pallidioribus, brachiis antice mammillatis; carpo ad basin interne uni-denticulato; cauda articulo ultimo pallidiore spina apice ferruginea.

Longitudo 0019 millemetrorum.

Habitat inter scopulorum fissuras, et sub lapidibus prope Nice vulgatissimus.

S. with hands, mandibles, thorax, abdomen and tail, olive-brown; feet paler; arms anteriorly mammillated; the wrist at its base internally with one very small tooth; the last joint of the tail paler; apex of spine ferruginous. Length 8¼-12 of an inch.

Found very common in the fissures of rocks and und er stones near Nice.

ACTINIADA.

Genus anenomia.

Corpus cylindricum ad basin abrupte dilatatum.

Os nullo modo prominens.

Tentaculo in serie triplici disposita, augustia valde elongata gradatim acuminata apicibus rotundatis obtusiunculis.

The body cylindric, abruptly dilated at its base.

The mouth not prominent.

The tentacules arranged in a triple series very much elongated, gradually acuminated, their extremities rounded and rather obtuse.

Anenomia vagans.

A. corpore toto et tentaculis hepaticis pallidissimis, hyalinis, translucidis; apicibus sæpius pallidioribus.

Altitudo 13 millemetrorum; latitudo 11 millemetrorum.

Habitat in maris Mediterranei littora, ad saxa adhærens, at vagans.

The body and the tentacules very pale liver-coloured, transparent, translucid, with their extremities generally paler.

Height 13 millemetres; breadth 11 millemetres.

Inhabits the rocky shores of the Mediterranean, adhering to rocks, but very frequently shifting its quarters.

Genus Seraphisa.

Corpus cylindricum ad basin abrupte dilatatum.

Os prominens.

Tentacula in serie quadruplici disposita, moderatim elongata, gradatim acuminata, acuta.

The body cylindrical, abruptly dilated at its base.

The mouth prominent.

The tentacules arranged in a quadruple series, moderately elongated, gradually acuminated and acute.

1. *Seraphisa lineata.*

S. corpore purpureo carneo, lineis longitudinalibus albidis distantibus, disco et ore carneis lineis divaricantibus eburneis ornatis; tentaculis carneis pallidissimis, hyalinis ad bases purpureis, annulis violascentibus et eburneis alternatibus ornatis.

Altitudo 5 centimetrorum; latitudo 18 millemetrorum.

Habitat in maris Mediterranei littora scopulosa ad saxa adhærens,

The body purple, inclining to flesh-colour, ornamented with longitudinal distant whitish lines; disk and mouth ornamented with ivory-white lines; tentacules very pale flesh-coloured, transparent; their bases purplish, ornamented with alternating pale violet and ivory-white rings.

Height 5 centimetres; breadth 18 millemetres.

Inhabits the rocky shores of the Mediterranean, adhering to rocks.

2. *Seraphisa modesta.*

S. colore hepatico pallido, carneo maculato; disco, ore et tentaculis hyalino, pellucidis violascentibus annulis purpurascentibus ornatis.

Magnitudo omnino prœcedentis.

Habitat in maris Mediterranean littora scopulosa ad saxa adhærens.

Body pale liver-coloured, spotted with flesh-colour; disk, mouth, and tentacules hyaline, pellucid, pale violet-coloured ornamented with purplish rings.

The same magnitude as the preceding.

Inhabits the rocky shores of the Mediterranean, adhering to rocks.

MOLLUSCA GASTEROPODA.

1. *Succinea elegans.*

S. testa elongata, glabro, nitida succinea, anfractubus transversim undulatim striolatis. Animale nigro-grisco commixto notato; capite ruguloso flavescente nigro punctulato; pelli pedeque grisco-flavescentibus nigro punctulatis; oculis atris.

Habitat in paludibus prope Nice vulgatissima; magnitudo omnino S. Mulleriana.

S. with the shell lengthened, smooth glossy amber-coloured, with the whirls transversely undulately striolated; the animal marked with grey mixed with black; head roughish, yellowish punctulated with black; eyes jet black.

Inhabits marshes near Nice: is very common, and exactly the size of S. Mulleriana.

2. *Succinea patula.*

S. teste valde elongata ventricosa globa nitida succinea; anfractubus transversim undulatim striolatis; apertura valde patula. Animal, dorso, pede, pallio, tentaculisque glaucis intensis nigro punctulatis.

Habitat in paludibus prope Nice rarissima.

S. with the shell very much elongated, ventricose smooth glossy, saffron-coloured; with the whirls transversely undulately striolated; the aperture very open, (patulans;) animal with the back, foot, mantle, and the tentacules deep sea-green punctulated with blackish.

Very rare in the marshes near Nice.*

ANNELICIDÆ.

Sanguisuga Meridionalis.

S. corpore atro-purpureo, lineis duabus longitudinalibus croceis nigro punctulatis; notato lateribus olivaceis maculis punctisque atris maculatis; abdomine olivaceo.

Habitat in fluviis meridionalibus lente fluentibus; in fluvio Var haud infrequenter capta.

Longitudo 1100 millemetrorum.

S. with the body jet black purple; marked with two longitudinal saffron lines punctulated with black; the sides olive green spotted with jet black spots and dots; abdomen olive.

* I have seen but three living specimens.

Found in those rivers in the south of Europe that flow slowly; not unfrequently taken in the Var.

Length 44-12 of an inch.

Hirudo bicolor.

H. dorso vindescente, lineis duabus longitudinalibus croceis, notato, abdomine croceo sordido.

Longitudo 0016 millemetrorum.

Habitat in paludibus et stagnis, prope Nice.

H. with the back greenish marked with two longitudinal saffron lines; abdomen dirty saffron.

Found very commonly in the marshes and pools near Nice.

SPONGIADÆ.

*Tameigastra.**

Corpus elongatum, antice, posticeque rotundatum, liberum ante aperturam, abrupte acuminatum ciliatum, postice clausum rotundatum. Ventriculis corporis longitudinis postice augustis; superficies interna cellulis numerosis ovatis excavatis sculpta; parietates spongiosæ.

Tameigastra Mediterranea.

T. corpore grisco ruguloso, villosulo; ciliis anticis margaritaceis irridescentibus; villis griscis. Longitudo 0040 millemetrorum.

Habitat mari Mediterranea in Villa Franca sinu, vulgatissima.

T. with the body grey, roughish, slightly villose; the anterior cilice pearly, and irridescent.

Found abundantly in the bay of Villa Franca.

* ταμειον, cellula et γαστηρ, venter.

ON TWO NEW GENERA OF CRUSTACEOUS ANIMALS, DISCOVERED BY MR. JOHN CRANCH IN THE EXPEDITION TO CONGO.

MALACOSTRACA.

*Odontorynchus.**

Thorax antice rostratus; rostrum acuminatum utrinque alternatim dentatum. Lamellæ caudales magnæ elongatæ foliaceæ postice latiores apice rotundatæ. Pedum par anticum minutum, bifidum; secundum longius bifidum; tria postica multo largiora, simplicia. Antennæ interiores bifidæ; articulo secundo multiarticulato; exteriores acuminatæ paululum longiores multiarticulatæ.

Thorax anteriorly rostrated; rostrum acuminated on each side alternately dentated. Caudal lamellæ large, elongated, foliaceous behind broader, with the extremities rounded. Anterior pair of feet minute bifid; second pair longer bifid; hinder pair much larger simple.

Interior antennæ bifid; the second joint many jointed.

* ωδοντωθεις dentatus, et ρυγχος, rostrum. It belongs to the family Squilladæ.

Odontocerus lutescens.

O. Corpore toto, antennis, pedibus, lamellisque caudalibus luteis.

Longitudo 0052 mellemetrorum.

Habitat ad Guineæ littora.

O. With all the body, antennæ, feet and caudal lamellæ clay-coloured.

Length 23-12 of an inch.

Inhabits the shores of Guinea.

*Prionorhynchus.**

Thorax convexus, elongatus, antice rostratus; rostrum utrinque ultra medium serratum; postice filamento corneo acuminato largo instructus. Pedum par anticum tenue bifidum acuminatum; paria quatuor, postica æqualia unguibus trifidis instructa. Lamellæ caudales æquales ovatæ foliaceæ. Oculis magnis.

Antennæ interiores bifidæ, multi-articulatæ acuminatæ; exteriores, longiores acuminatæ multi-articulatæ.

Thorax convex, elongated, anteriorly rostrated; rostrum on each side beyond the middle, serrated; with a long horny acuminated filament behind. First pair of feet acuminated, slender and bifid; the four hinder parts equal with trifid nails; caudal lamellæ equal, oval, foliaceous; eyes large.

Interior antennæ bifid, many jointed, acuminated; exterior antennæ; longer, acuminated, many-jointed.

* πριων, serra, et ρυγχος, rostrum.

Prionorhynchus Cranchianus.

P. Thorace, rostroque gilvo auro variegatis; filamento corneo sanguineo; antennis, pedibus, abdomineque carneis pallidis; oculis aureis.

Longitudo 0021 millemetrorum.

Habitat in Mari Atlantico. Lat. 24°. 13′. Long. 18°. 51′. 15″.

P. With the thorax and beak carnation variegated with gold; the horny filament deep blood red, the antennæ, feet and abdomen, pale red; eyes golden.

Length 9½-12 of an inch.

Found in the Atlantic ocean. Lat. 24°. 13′. Long. 18°. 51′. 15″. on the surface of the sea.

ON THREE NEW GENERA OF THE MALACOSTRACEOUS CRUSTACEA, BELONGING TO THE FAMILY SQUILLADÆ, BY WILLIAM ELFORD LEACH, M. D. F. R. S. &c. HONORARY MEMBER OF THE PLYMOUTH INSTITUTION.

*Opithiocheirus.**

Antennæ duæ elongatæ, quatuor-articulatæ; articulo ultimo acuminato multiarticulato tertio, externe filamentis duabus æqualibus acuminatis multarticulatis instructo.

Pedum paria tria antica simplicia æqualia ambulatoria, par quintum laius compressum, manu uni-dactylo interne denticulata, instructum.

Antennæ two, elongated, four-jointed; the last joint acuminated many-jointed; the third joint externally furnished with two equal acuminated many jointed filaments.

Feet, the three anterior pair simply formed for walking, the fifth pair broader compressed, furnished with a monodactyle hand internally denticulated.

Opithiocheirus Chrysophthalmus.

O. Thorace antennis, pedibus et oculorum pedunculo, croceo testaceo marmoratis; oculis aureis, pupillo nigrescente; abdomine segmentis postice, et manus aspectu interno, aureis.

* οπιϑιος, posticus, et χειρ, manus.

Longitudo 0042 millemetrorum.

Habitat in mari Atlantico prope fluvii Congoensis os.

O. With the thorax, antennæ and peduncle of the eyes marbled with saffron and testaceous (clay colour;) the eyes golden, with a black pupil; the same segments of the abdomen behind, and the internal aspect of the hand golden.

Length 17-12 of an inch.

Inhabits the Atlantic ocean near the river Congo.

*Usterocheirus.**

Antennæ quatuor internæ bifidæ; setæ acuminatæ multiarticulatæ; externæ longiores acuminatæ multiarticulatæ.

Pedum paria quatuor, anteriories æquales, acuminata, pedipalporum exteriores (qui etiam sunt acuminati) multo longiora, par quintum latius compressum manu uni-dactylo inermi instructum.

Antennæ four, the internal ones bifid; the setæ acuminated many-jointed; external ones longer, acuminated, multiarticulated.

Feet; the four anterior pair equal acuminated, much longer than the exterior pedipalpi (which are also acuminate) the fifth pair broad compressed, furnished with a mono-dactyle unarmed simple hand.

Usterocheirus Macropocoilium.†

U. Thorace, antennis, oculis, pedipalpis, pedibus abdomine-

* ὑστερος posterior, et χειρ, manus.

† μακρος, longus, et ποκιλιον, abdomen.

que testaceo croceo-testaceo sordido variegatis; oculorum pupillæ nigrescentes: abdomine elongato augusto coarctato, segmentis postice, atris.

Longitudo 0055 millemetrorum.

Habitat in mari Atlantico; fuco natanti adhærens.

U. With the thorax, antennæ, eyes, pedipalpi, feet and abdomen testaceous variagated with dusky saffron testaceous, jet black; the pupil of the eyes blackish; the abdomen elongated narrow contracted; the segments behind black.

Length 2 inches.

Inhabits the Atlantic, adhering to fucus natans.

2. *Usteroocheirus Brachypocoilion.*

U. Thorace, antennisque brunneis; pedibus abdomineque pallidioribus; abdomine brevissimo latissimo.

Longitudo 0029 millemetrorum.

Habitat cum præcedente.

U. With the thorax and antennæ brown; the feet and abdomen paler; the abdomen very short and very broad.

Length 13-12 of an inch.

Found with the preceding.

Zuphanusa.

Antennæ quatuor, elongatæ trifidæ, multi articulatæ; apice externe ciliatæ; filamentum inferius, superiore longiore interne ciliatum, exteriores basi filiformi; lamella ovata compressa ciliata, terminati; filamentula ad basin externe instructa.

Pedum paria duo antica mono-dactylo anteriore minore augustiose: paria tria postica, æquales anguibus arcuatis instructa.

Antennæ four elongated, trifid, many-jointed, with the apex externally ciliated; external ones with a filiform base terminated with an ovate compressed ciliated lamella, furnished at its base externally with a very minute filament.

Zuphanusa Smithiana.

Z. Thorace antennis, oculorum pedunculo, pedibus abdomineque hyalino, ocraceo florescentibus.

Longitudo 0054 millemetrorum.

Habitat in mari Atlantico, fuco natanti adhærens.

Z. With the thorax, antennæ peduncles of the eyes, feet and abdomen and hyaline, ochre yellowish.

Length 2 inches.

Inhabits the Atlantic ocean adhering to fucus natans.

ON THE GENUS MEGALOPHTHALMUS, A NEW AND VERY INTERESTING GENUS, COMPLETELY PROVING THE THEORY OF JULES-CÆSAR SAVIGNY TO BE CORRECT; BY WILLIAM ELFORD LEACH, M. D. F. R. S. &c. HONORARY MEMBER OF THE PLYMOUTH INSTITUTION.

MEGALOPHTHALMUS.

Antennæ omnino fere ut in genere Palamonide.

Oculi, maximi subglobosi; pupillæ reticulatæ.

Pedum, paria prima, secunda, tertia, quarta, quinta et sexta, consimilia natatoria; par septimum stirpe interne compressa plus complicata; pedipalpum fere verum efformans; par nonum stirpe interna compressum pedipalpum verum efformat; stirpe externa brevissima apice bifida.

Lamellæ caudales valda inæquales.

Antennæ resembling in almost all respects the genus Palamon.

Eyes very large; subglobose, the pupils reticulated.

Feet; the first, second, third, fourth, fifth and sixth pair alike in form and size, and formed for swimming; the seventh pair with the internal footstalk compressed, half formed into a pedipalpus; the eighth pair with the external stirps compressed, more complicated, forming almost a true pedipalpus; the external footstalk is very short, with its apex very short and bifid.

Caudal lamellæ very unequal.

Megalophthalmus Fabricianus.

M. totus hyalinus fulvescens; oculorum pupillis aterrimis; abdominis segmentis supra stellatim sculptis.

Longitudo 0015 millemetrorum.

Cancer pedatus, *Othonis Fabricii, Faun. Græn.* 243, *No.* 221.

Habitat in mari Boreali vulgatissimus.

M. wholly hyaline fulvescent; the pupil of the eyes jet black; the abdominal segments sculptured with striæ forming a star.

Length 7-92 of an inch.

Found abundantly in the nothern seas, especially on the coast of Greenland, and in Baffin's bay.

I will now shew how the genus Megalophthalmus explains the theory of Savigny, respecting the various functions performed by the eighteen pair of legs, which he affirms, belong to all the genera of the Crustacea Malacostraca Pedophthalmia.

In the majority of the genera the five anterior pairs of feet perform the offices of locomotion, or of prehension; and the four hinder pairs, those of manducation or of carrying the food to the mouth; which in all the genera is furnished with two hard testaceous jaws.

This is the only genus in which the three pairs before the five hinder pairs perform the functions of locomotion; the change in the three hinder ones, from the five pair of the hinder ones is so gradual, that his theory is in my opinion satisfactorily established; and may in all probability be more fully so, by the discovery of some genus that has not yet been observed. I again state from my own observation, that I think his theory stands on a fair base, and wants but little (if any thing,) to confirm it.

VI.

ANTIQUARIAN INVESTIGATIONS IN THE FOREST OF DARTMOOR, DEVON; BY SAMUEL ROWE, B. A. MEMBER OF THE PLYMOUTH INSTITUTION.

The extensive tract of hilly country which occupies so large a portion of the central districts of Devonshire, has long possessed an invidious celebrity under the name of Dartmoor, as a region whose wildness and sterility have grown into "a proverb and a bye-word." This circumstance, however satisfactorily it may account for the slight and general notices which have been usually bestowed upon the Forest of Dartmoor by topographers and historians, will by no means justify the neglect of the antiquary; since the very barrenness which deters others from any investigation in a region so unpromising, often secures the most favourable field for his researches.

Finding in the mountains and morasses of Dartmoor the most authentic vestiges of a period of chronology, of which so little that is authentic remains to us, I cannot bring myself to join in the lamentations* over the sterility of the district, which the mention of its name usually calls forth. Grand as they are in themselves, the hills and tors of Dartmoor acquire additional interest as the guardians and preservers of relics, which in more accessible, and more attractive spots, would have shared the fate of too many of their kindred, and disappeared under the tool of the workman. Such tracts of country afford still some shelter from the various modes of destruction, arising from multiplied population and increasing commercial speculations, which have pursued the vestiges of past ages from one retreat to another, like the antient Britons retiring before successive invaders, until the mountainous districts of the western and south-western parts of the kingdom afford them the only protection. In these districts, therefore, the antiquary naturally looks for the vestiges of this people and their times; and as many of the most interesting relics are in hourly danger of spoliation, the notices in the following paper have been collected and published, with the hope that some may escape impending destruction, and that others may be preserved from that oblivion which appears to endanger the very memory of their existence.

Of almost all the relics of Druidical antiquity, the moorland districts of Devonshire afford specimens, which, generally speaking, have been most imperfectly and unsatisfactorily noticed by antiquaries. Cornwall has had more justice in the accurate and laborious notices of Borlase, who has carefully enumerated the relics of that county;—but our Risdon, in mentioning the curiosities of Dartmoor, records only three remarkable things:—viz. the Stannary Parliament seats on Crockern Tor, Childe of Plymstock's tomb, and Wistman's

* On the contrary the apostrophe which the hills of Dartmoor call forth is that of Wordsworth—

Hail usages of antient mould,
And ye that guard them, mountains old!

wood. Yet on the moor and within its precincts, are to be found examples of the sacred circle—avenues—the cromlech—the kistvaen—the rock idol—rock-basin—monumental pillar—the cairn, or barrow—dwellings and track-ways.

Of these several relics of the olden time, I proceed to give some notices collected from personal observation, made during the summers of 1827 and 1828, by the following members of the Plymouth Institution:—Mr. Henry Woollcombe, Major Hamilton Smith, Mr. John Prideaux, and myself. The following paper, containing the results of our united researches has been drawn up for publication in the Transactions of the society, at the request of my esteemed coadjutors.

In the classification of Druidical antiquities, precedence seems due to the Sacred Circle, both for the importance of its object, and from the circumstance that sacred circles in other places are usually ranked among the most interesting of such relics. The sacred circle was evidently a rude patriarchal temple, such as the genius of the people and of their religion demanded, and for the construction of which the region supplied ample and congenial materials. The accidents of nature have more to do with the decision of matters of this kind than we are usually free to allow. The colossal architecture of Egypt had its birth in the granite quarries of that country—the bituminous plains of Babylon suggested the employment of brick in the construction of the vast edifices of that gorgeous city. The granite tors of Cornwall and Devon in like manner, furnished materials for the apparatus of Druidical worship, abundant in supply, and suitable in form and quality; as to form, sublime from their rudeness and vastness; and as to durability, imperishable as the hill from whence they were raised.

Although the Druidical doctrines inculcated the opinion that the Deity regarded not the worship which was paid to him in temples, whose canopy was less comprehensive and sublime than the expanse of heaven; they held it indispensable, that certain spots should be dedicated to his peculiar service: and so profound was the respect with which the dogmas of this extraordinary priesthood were regarded, that they appear to have had nothing more to effect for the preservation of their sanctuaries from violation, than to mark their limits by some well defined boundary—a boundary which should denote the extent of the sacred area without obstructing the view of the rites and ceremonies therein performed. This object, which the Hellenic nations accomplished by celebrating their sacred rites in front of their temples and beneath their porticoes, the Druids attained by means of a circular fence of unwrought granite masses, rude from the neighbouring tor.

Such are the sacred circles found on Dartmoor, in a state as might be expected more or less perfect. They are of various dimensions, and constructed of moorstone blocks of irregular shapes, and by no means uniform in size. Taking a general view of monuments of this class in our island, some antiquaries have fixed the number of stones as varying from twelve to twenty-seven; and state that they are more frequently found of the former number than of any other; this conjecture, however, seems to be much at variance with conclusions founded on actual observation. We have found them consisting of ten, eleven, twelve, fifteen, twenty-five, and twenty-seven stones. The size of the stones varying from eighteen inches in height to five feet. The circumference of the circle varies from twelve yards to one hundred and twenty, which is the size of the Grey Wethers, the largest yet discovered on the moor.

The sacred circle sometimes has a cairn or kistvaen within the inclosure—sometimes is found in connexion with avenues—sometimes in connexion with others—and in one instance it contains two concentric circles within its circumference. This description of circle is at once distinguished from the hut circle, or ruined dwelling, by the position of the stones composing it, which are always set up at intervals of greater or less extent; whereas the hut circles have the stones set as closely together as the nature of the construction would permit.

The most striking of the sacred circles are those near Sittaford tor in the centre of the moor, and that on Gidleigh common. The former are known to the moormen by the name of the Grey Wethers; and are two circles, whose circumferences almost touch each other. They were originally constructed of twenty-five stones each; nine remain erect in one, and seven in the other. These masses have been selected with care, being slabs, tolerably level in the upper edge; the largest is fallen—it is four feet nine inches wide, less than a foot thick, and must have stood about five feet high. Diameter of both circles, one hundred and twenty feet.

The Gidleigh circle consisting of stones, which are for the most part pointed, presents a very different aspect from the Grey Wethers. They are thirty-seven in number, ten of which are fallen. The highest of those in their original position, is eight feet above the ground; the medium height of the largest number is about four feet and a half, the smallest stone is three feet. Diameter of the circle, ninety feet.

The avenues* or parallel lines of erect stones appear to have excited little attention, yet the peculiarity of their appearance connot fail immediately to strike a spectator. They are sometimes found singly, and sometimes in pairs, but always in connexion with other British relics, and most commonly with the sacred circle.

* The word *avenue* is not altogether satisfactory, but we are at a loss for a more descriptive term.

These ancient erections when near streams were probably intended for the procession of the consecrated boat; in situations remote from waters, it is more probable that they were constructed for gymnastic performances in connexion with the celebration of religious worship.

The largest and most perfect relic of this class is in the ancient British village, near Merivale bridge. Here is a pair of avenues parallel to each other, one hundred and five feet apart, rnnning east and west; the longest one thousand one hundred and forty-three feet, the shortest seven hundred and ninety-two feet. The stones of which they are formed are scarcely two feet above the ground, placed at irregular distances, but generally about three feet and a half apart. The shortest terminates in a circle, and the longest has a circle at mid-length. The shortest at its east end, has a stone of larger dimensions; and in the other avenue opposite to it, is a corresponding block, although in this it seems at a distance from the termination of its avenue. The western half of this avenue is divided at mid-length by a higher stone, and ends with two stones now recumbent.

A similar pair of avenues, but not so extensive in their plan, is found in connexion with other similar antiquities on the brook side, below Black tor. The stones there employed in the construction, are two feet and a half high. A stream forms the western termination of both of these avenues, the southern is to be traced about one hundred and eighty feet, and the northern, which is much more perfect and distinct, three hundred. They are forty feet apart, and run parallel to each other, due east and west, and each is terminated at the east end, by a circle thirty feet in diameter, inclosing a cairn. The stones at the head of the avenues as in the former example, being of larger dimensions than the others.

In both these instances the avenues run east and west; but others are found in the direction of north and south. A single avenue of this kind occurs on Challacombe down, three hundred feet in length;—another on Gidleigh common, four hundred and two feet in length, and four feet and a half in breadth; the latter is formed in connexion with a singular set of concentric circles. In this locality is another pair of parallel avenues in the same direction, in which many of the stones are three feet and a half high, of a triangular shape, the points forming a very acute angle. It is probable that a considerable portion of the eastern avenue has been destroyed, as only one hundred and twenty-three feet of it can be traced, while the other can be followed to an extent of four hundred and thirty-two feet.

Of all our Druidical monuments, purely artificial, the Cromlech is that which is the most striking in appearance, and the most eminently characteristic of the age to which such monuments are usually assigned. The finest and perhaps the only perfect specimen in Devonshire is at Shilston, in the parish of Drewsteignton. The masses whereof it is constructed have been selected, as adapted for the purpose in their natural state,—no tool appears to have been passed upon them,—and this absence of artificial preparation, contrasted with the indication of great power exerted in the fabric, confers a venerable rudeness on this singular and interesting relic.

The Drewsteignton Cromlech is formed of four stones; viz. three supporters and the quoit or impost. The impost is forty-one feet in circumference, and in many parts is from two to three feet in thickness. From these dimensions a notion may be formed of the mass thus elevated on the supporters, the lowest of which stands five feet three inches above the surface, the others being sufficiently high for a man to stand erect beneath the massive canopy of the impost. This has an inclination to the westward, which with a bevil in the same direction gives to the surface of the impost a considerable slope.*

* Cromlechs are of two kinds. I. The Cromlech properly so called, consist-

This is not only the finest and most perfect specimen in Devonshire, but it is generally regarded as furnishing the sole example of which our county can boast. Could this opinion be established it would appear singular, if not anomalous, that in a region where the other Druidical relics are so abundant, this characteristic monument should so sparingly appear. In the adjoining county of Cornwall we know they are numerous; and the most cursory observer could not visit a single tor on Dartmoor, without perceiving that a want of appropriate and ready materials, did not stand in the way of their erection in this chosen district. The supposition naturally arising from these circumstances has been justified, in more than one instance, by the discovery of monuments of this class hitherto unnoticed. On Shaugh moor is one, which, if it be that noticed by Polwhele, is mentioned by that author only to have its claims disallowed; but for reasons which a view of the cromlech will instantly show to be both inapplicable and groundless. The quoit is doubtless supported in an unusual manner, resting partly on a natural ledge of rock—but that stone itself possesses every characteristic of the cromlech quoit, and apparently remains in its original position. At Karn Boscawen near Penzance, is a similar monument (figured in Borlase's Antiquities,) where the quoit is partially supported by the natural rock, as in the present instance.

In the antient ruined village at Merivale bridge, is a pros-

ing of three upright stones and a quoit. II. Arkite cells, consisting of rude walls and single stones, covered with one quoit or four large stones. The former of these appear to be altars, the latter mysterious cells in which the arcana of religious worship were practised; and inhumation was occasionally allowed, or at least where human remains have been found. Drewsteignton cromlech is of the first kind, where the ground beneath the stones could not have been opened for burial without endangering the whole structure—Catigern's or Kit's Coty house, in Kent, is of the second. A third are Arkite temples, resembling the second, but larger, and often with several chambers; such are the Grottes des feu near Tours, and another near Rennes in France. They are six feet high in the clear and full forty feet in length; and served for the greater mysteries.—*Note by Major C. H. Smith.*

trate cromlech. The quoit, ten feet six by five feet four inches, has fallen from its three supporters, and remains in an angle of 45°. Natural circumstances would not satisfactorily account for the present position of the stones; the ground being nearly flat the quoit could not have slipped from a higher spot into its present site—nor are there, as on tors, numerous blocks of a similar description promiscuously scattered around; this is sufficiently distinct in appearance to attract immediate attention. In the same village is another conformation of four stones, appearing like three supporters and a quoit, less decidedly artificial, though bearing great resemblance to a prostrate cromlech, wherein the quoit is of much larger dimensions, being no less than sixteen feet in length, and nine feet eight inches in breadth.

Below Furtor, near the Tavy head, is another fallen cromlech, about a furlong from the eastern bank. Although surrounded by scattered masses of granite, its distinction is sufficiently marked. The quoit thirteen feet by five, remarkably regular in shape, has fallen with its longest side to the ground, into which it has partly imbedded itself; the base being overgrown with luxuriant heather. The supporting slabs are crippled under the quoit, and retain it in a position less inclined than the former. These slabs are three, and three only—for there are no similar masses so near, as to render the monument of a doubtful character; nor are there any appearances which would induce the observer to refer it to natural circumstances. Its site is one of the most secluded spots on the moor, apart from any other relic of Druidical antiquity.

The Logan stone and Rock idol, though belonging to the class of Druidical antiquities, can boast so little, if any, artificial preparation, that in an enumeration of the present kind, they will not long detain our attention. The celebrated specimen of the first of these monuments, the Drewsteignton logan stone, might be repeatedly passed, without exciting more curiosity or attention, than any other fine granite mass in the bed of a river. Advantage was doubtless taken by the Druids, of the natural circumstances on which this rock was found, and its motion might have been rendered subservient to the purposes of superstition. On the application of considerable strength at its east end, its motion is just perceptible.* But it is impossible to traverse the moor in any direction, without observing many a block, which once might have been a logan stone, or even now might be easily made to *logg*;—so fantastical and singular are the positions in which those masses are continually found.

Similar observations will apply to the Rock-idol. "Moulded" as they are, as Carrington sings,

> "Into a thousand shapes
> Of beauty and of grandeur,"

few are the tors which would not attract sufficient attention, when pointed out to the adoration of an ignorant and superstitious people. To give any accurate notice of objects of this class, would be scarcely less than to enumerate the principal tors on the moor; or rather, it would be impossible in a classification with which the imagination would have much more to do than the judgment. Yet when we gaze upon such a mass as Vissen Tor, grand and huge as it rises above the vale of the Walkham,—or view such a singular pile as that of Bowerman's nose, we can scarcely err in believing, that if the Druids had their rock-idols, *these* must have held an important station in their granite mythology. Bowerman's nose consists of five layers of granite blocks, some of them severed into two masses, others entire: the topmost is a single one. This singular pile stands about thirty feet in height, and rising perpendicularly from the brow of a rocky hill, is a conspicuous object, and strongly recalls the rude colossal idols, which were found by our navigators when they visited Easter Island.

* In September, 1828.

But none of these observations, here applied to the Logan stone and rock idol, appear to bear upon the rock basin, although some authors have attributed them to the formation of nature, by the action of water, and from the decomposition of some parts of the rock more than others. It seems extraordinary however, that any one who has examined these singular relics of antiquity, should advocate an opinion so devoid of the confirmation of facts. Were the rock basins natural productions, why are they found so uniform in size? Why are they so frequently seen on those parts of granite masses less favourable than other parts to their natural formation? Their situation is commonly on the highest spot of the loftiest pile of the tor, very often near the edge of the block upon which they are formed,—in many instances with a lip or channel to convey the water over the edge of the mass, and generally varying in diameter from twelve inches to thirty-six.

A very fine example, illustrating this general description of the Dartmoor rock basins, occurs on the north end of the topmost Great Mistor, one of the loftiest hills of the moor. The basin is in a most perfect state, in form a circle, three feet in diameter and eight inches deep. Its sides are perpendicular, its bottom flat; having a lip cut in the rock in its northern edge. It would be most characteristically described as a pan excavated in granite, and bears such evident marks of artificial preparation as could not fail to convince an unprejudiced inquirer.

That this rude and primitive species of basin formed part of the apparatus of Druidism, there can little doubt remain; but the specific purpose for which they were constructed has excited much inquiry, and no small controversy. The frequent occurrence of rock basins on the surface of logan stones, induced Dr. Borlase to suppose that they were employed for the purpose of regulating the motion of the logan stone, and of causing it "to move obsequious to the gentlest touch;" or "to stand as fix'd as Snowdon;" so that the ordeal might exculpate or condemn, according to the private intentions of the ministering Druid. This object he believes might be accomplished by causing a certain quantity of water to be poured into, or be withdrawn from, the basins, and thus the centre of gravity be changed. But all logan stones have not basins; nor are they found on logan stones in a majority of instances, being far more numerous on other masses. The hypothesis that they are formed on the loftiest tors for the purpose of obtaining water for lustration, in a state freest from earthly pollution, is far more probable, and derives strong confirmation from the situations in which they are so frequently found.

The Rock pillar, monumental column, maen or mên, is also found on Dartmoor. A striking specimen appears at the ancient Merivale village;* an unwrought granite shaft, of a tapering form, presenting a rude type of the obelisk, twelve feet high, and eight feet in girth at the base. On Bair down is another of these primitive obelisks, twelve feet high; its general character and dimensions being similar to the former.

Those who wish to derogate from the antiquity of these monuments, have pronounced them to be mere bound-stones of comparatively modern date, to mark the limits of such divisions as hundreds, parishes, manors, or commons. A slight inspection will, however, satisfy an observer that this conclusion is ill-founded; for although some of the maens may have been thus appropriated, as at Gidleigh, a marked distinction will be perceived, when a known modern bound-stone is compared with one of those venerable obelisks.

It will be remarked that the antiquities hitherto mentioned, have, more or less, decidedly a sacred or religious destination.

* The maen of Merivale is in connexion with the avenues, cairn, and cromlech, as is evident on referring to the plan. I suppose it to be a gnomon to mark the mid-day moment.—*Note by Major C. H. Smith.*

We now proceed to enumerate those which are of a civil or military description; viz. the Barrow or Cairn, the Kistvaen, the Beacon, Huts, Pounds or Inclosures, and Trackways.

The BARROW and CAIRN are too well known to require any more than a passing notice, as the tombs, or sepulchral monuments of the antient inhabitants of this island. Like the maen, or rock-pillar, they are among the most ready and obvious means, at the command of a simple and uncivilized people,* to perpetuate the memory of any solemn or remarkable transaction. Where stones are not plentiful, and to be made easily available, the *barrow*, or *mound of earth* has been resorted to; but those on Dartmoor are chiefly cairns in the more limited sense, and being very commonly placed on the summits of the highest hills, became the chosen site for beacons—from which some of the loftiest Devonshire mountains have acquired their appellations, as Pen beacon, West and East beacon, and Cawson beacon.

Cawson is the highest land in Devonshire, its summit being more than one thousand seven hundred feet above the sea-level. On this spot is a cairn ninety-one yards in circuit, which has been opened in two places. No point could be chosen for the site of a beacon, to alarm a wide extent of country, more advantageous than this, which commands the surrounding districts, as far as the shores of the English and British Channels. The great cairn at Three-barrow tor, which is entirely composed of small stones, is one hundred and twenty yards in circuit.

Sometimes the cairn has a kistvaen or small cromlech on its summit, like Molfra cromlech, Cornwall. The kistvaen,

* The cairn or tumulus of stones was resorted to, as a perpetual record of the treaty of reconciliation and amity between Jacob and his father-in-law Laban, and what is very remarkable, this cairn, which was called Mizpeh, *the heap of witness*, was accompanied by the monumental pillar; and to this day, cairns are found with a columnar stone in the centre.

which may be described as a rudely formed sarcophagus, is sometimes also found imbedded in the cairn. An instance of this occurs on the top of Cawson; where the cairn though not large, is composed of large stones, and contains a kistvaen of a rectangular outline, formed of granite slabs four or five inches thick. Two corner slabs remain in an erect position, and are joined as closely, and with as much precision, as the unwrought material would permit; the remainder are more or less fallen, and some appear to be wanting.

Kistvaens are also found in connection with the sacred circle, but are more usually observed in a state which may be described as *simply placed,* i. e. independently of any other relic. Examples of both these kinds occur on Archerton hill. Sometimes they are found in groups as Colden tor, on the brink of Blackabrook, placed around a rock basin. Their general dimensions are three feet three inches long, two feet wide, and two deep. A flat unwrought stone covers this cell, and in the centre is a round pit, from which, there is good reason for supposing, a cinerary urn has been removed. This group of tombs forcibly recalls the burial places described by Ossian. Here then we have a Druidical cemetery; and that, probably, one where the ashes of the less distinguished dead found a repository; while the warriors and chieftain were honoured by the enormous cairn or barrow, and the Druid slept his long sleep beneath the massive cromlech, within the sacred circle.

The HUTS or dwellings of the antient inhabitants are to be found in every part of Dartmoor, in a state generally very imperfect; the foundation stones, and those forming the door jambs, being all that remain of these dwellings, with few exceptions. The huts are circular on the plan; but are at once distinguishable from the sacred circle, which has been already described as consisting of larger stones, placed with considerable intervals, as in these the stones are set on their edge, and placed closely together, so as to form a secure foundation for the superstructure, whether that they were wattle,* turf, stone, or other material. These vestiges strikingly illustrate the descriptions which Diodorus Siculus and Strabo give of the habitations of the Britons of their times. The former describes them as "poor cottages constructed of wood and covered with straw;" the latter as "wooden houses, circular in form, with lofty conical roofs."

The foundation slabs above-mentioned, generally stand from eighteen to thirty inches above the surface. The door-jambs in most cases higher, placed nearly at right angles to the outline of the circle; in a very considerable proportion of examples the door faces the south. These hut circles measure from twelve to thirty feet in diameter; the most usual size being about twenty-six feet, though some are found much larger. The single foundation is most common, but some have a double circle. A very perfect specimen of the antient dwellings has been observed, and it is believed, for the first time noticed as such, by Miss Dixon of Prince-town; a lady whose industry and perseverance in investigating the antiquities of Dartmoor have been as successful as unusual, and whose kindness in pointing out this and other interesting relics merits the most public acknowledgment. This venerable dwelling, belonging to the most ancient class of domestic buildings in the world, is found in the corner of a very remarkable inclosure which is divided by irregular lines of upright stones. The hut is in a state comparatively perfect, the upper part only having fallen in. It appears to have been shaped like a bee-hive, the wall being formed of large stones and turf, so placed as to terminate in a point.—The circumference is twenty yards.

These huts have their counterparts still extant in the shealings of the Orkneys, some of which, composed of stone and turf, have the form of ovens or bee-hives; and others with

* Junctæ cortice virgæ. Ovid.

a base of stone, consisting of two circles within each other, have a superstructure of fir or pine poles converging to a point, and covered with branches and heather. Both these kinds appear to have existed in Dartmoor. All these huts approach, with greater or less accuracy, to the circular form.

With very few exceptions, these antient dwellings are found in groups, either surrounded by rude inclosures, or unprovided with this protection. On the banks of the Walkham, near Merivale bridge, is a very extensive village, containing huts of various dimensions, built on a hill sloping towards the south-west. This village or town, appears to have been of considerable importance, as there are found in it, the avenue, the cromlech, maen and sacred circle. In this, as in many other villages on the moor, regard seems to have been had to a supply of water in the immediate vicinity; and, generally speaking, a preference appears to have been given to a south or south-western aspect. Near Littleford tor, is a group of sixty-seven hut circles, and many more appear to have been destroyed. Another village, scarcely less extensive, is near Black tor, on the banks of one of the tributaries of the Plym.

The Cyclopæan inclosures, or Pounds, as they are called by the moormen, frequently surround these antient towns. They are either low walls of stones piled rudely together in a ridge-like form, or belts of larger stones placed erect in the ground. Their general form is circular, but some examples are elliptical. Remains of habitations are in most cases found in these inclosures, so that we may justly conclude that they were originally constructed for purposes of security and defence.

Grimspound is by far the finest and most extraordinary of all the relics of this class. Viewed from Hooknor tor, which commands its entire area, it presents to the spectator an object of singular curiosity and interest. Its situation is on the N. W. slope of Hamildown, bordering on the parishes of Manaton, and Widecombe in the Moor. The wall or mound is formed of moorstone blocks, rudely piled together, but so large as not to be easily displaced. The base of this mound extends in some parts to twenty feet, but the average height of any section would not exceed six feet. With the exception of openings for ingress and egress, the wall is perfect, inclosing an area of about four acres. The vestiges of antient habitations within this primitive fence are numerous, and occupy the whole inclosure, leaving only one vacant spot at the upper end, which might haye been a place of public resort for the inhabitants of the town. A spring, rising on the eastern side, supplies the inclosure with water, and the whole presents a more complete specimen of an antient British settlement, provided with means of protracted defence, than will be found in any other part of the kingdom.

Many similar inclosures on a less extensive scale are found in every district of the moor. One, however, is so essentially different in construction from all the others we have noticed, that it merits a particular description in this place, especially since it appears that it belongs to the unrecorded and undescribed antiquities of Dartmoor.

In a small pasture field, about a furlong S. E. of Manaton church, adjoining a parish road, is an inclosure of an elliptical form, in an exceedingly perfect condition. The stones of which the fence is composed, are from four to six feet high, placed in a double row and set closely together. One stone, however, is so large that it fills the whole breadth of the fence, being six feet wide and five feet thick. The diameters of the area are one hundred, and one hundred and thirty-eight feet; and there are no vestiges of any Druidical relic within the precincts. It will be instantly distinguished from the sacred circles of Gidleigh and the Grey Wethers, by the position of the stones, which are without lateral intervals.*

* I conjecture this inclosure to have named the village of Manaton, or rather *Maen-y-dun*, the inclosure of erect stones.—*Note by Major C. H. Smith.*

Trackways, under which designation those roads or causeways, or perhaps boundary lines, which cross the moor in different directions are included, might with more accuracy be distinguished into the two classes of trackways and tracklines. *Trackways* in this more confined sense, would then mean those which traverse the moor to a very wide extent, ascending the hills, penetrating the bogs and swamps, and fording the rivers; while *tracklines* will describe those which connect inclosures or huts, commencing and terminating within the bounds of each village.

The most extensive trackway which has come under our notice, is one which is supposed to traverse the moor in a direction E. and W. from Hamildown to Great Mistor. Considerable portions of the line can be traced in a direction corresponding to these two points, but a large extent of it rests rather upon the testimony of tradition, than on existing remains; for this is one of the few relics of remote antiquity which seems to have excited any attention in the moormen. The oral topographers of the district recognise this trackway as the equator of the moorland region; all above it being considered the north, and all below it as the south country.* This circumstance, while it affords good evidence as to the antiquity of this relic, militates, it must be allowed, in some degree against the theory which would attribute to it the character of a road rather than that of a boundary.

The trackway may be seen in great perfection descending the northern slope of Chittaford down, towards the East Dart. It is formed of pebbly stones irregularly placed together, and forming a rude causeway, with its crest slightly raised above the level of the country; its mean breadth being from five to six feet. On this common, it is visible for a considerable

* On the authority of the Rev. J. M. Mason, Vicar of Widecombe, to whose intimate acquaintance with the topography of Dartmoor, and kindness in affording every information in his power, we are much indebted.

length, and can be traced, running due west, through Hollow-combe and up the opposite hill to Little White tor. Down the common towards the Dart it bends N.E. but takes a southerly direction in the level near Post bridge. With some difficulty it may be detected passing through the boggy meadows below Hartland farm. The peat cutters are said to come upon it below the surface; and the general direction is found to be E. and W.

Another portion has been observed passing over Archerton hill, and is visible to the extent of a mile. In formation and breadth it is precisely similar to the line already described. But the finest specimen of trackways as to breadth, is that which ascends the hill at Three-barrow tor. It terminates in the great cairn on the summit, but commences again on the opposite side, and proceeds down the hill in a N.W. direction. This trackway is full fifteen feet wide, though much obscured by the encroaching vegetation. The stones which have been recently torn out of the moss, have been piled up in a wall-like form; which will readily account for the disfigured character of some of the relics.

The Tracklines are greatly similar in construction to the trackways, but less extensive. They have been, hitherto, invariably observed in connexion with antient dwellings and sepulchral remains, and in great probability served for bounds or pathways, connecting and inclosing dwellings, while the former might have been designed in like manner to facilitate the intercourse between villages and towns.

Numerous examples of the tracklines occur in various parts of the moor. At Torhill, near Rippon tor, they intersect each other at right angles in such numbers, that nearly the whole of the eastern slope is partitioned into squares, conveying in a striking manner the idea of an antient rural settlement. This notion is strongly supported by the appearance of hut circles, which are found in many of these primitive divisions.

But the tracklines are generally observed, as it might be expected, of more irregular forms. On the N. W. side of Cawson hill, they are seen in a winding or serpentine form. They also occur in irregular forms on the slope of the hill, south of Wistman's wood; and near Littleford tor, two dwellings are connected by a line which forms the segment of a circle. On the S. side of Heytor, more in the neighbourhood of Torrhill, they are again observed in rectangular outlines.

The trackways possess no characteristic which would lead us to assign their construction to the Roman period of British history; nor have we historical evidence that any of their roads ran through Danmonium in a direction corresponding to that of the Dartmoor trackways. Neither are there in them any marks of modern construction as fences or boundary lines; the remains of the oldest wall fences on the moor being constructed in a manner so strikingly different, as to be evident to any observer of common penetration. Similar remarks will apply to the tracklines in a great degree, and as they are found so intimately connected with ruined dwellings, and other remains of a remote æra, the inference seems just that would assign them to the same people and the same period. But as this relic of antiquity has hitherto received so little investigation, our opinions on this subject are not advanced without hesitation, and require further research before they can be considered sufficiently established.

Examples of the existing relics of Dartmoor and its precincts have thus been produced. I now proceed to a general notice of the principal of those relics, more agreeably to their topographical situation, commencing with Putor, near Sampford Spiney church, on the western skirts of the moor.

Putor is traditionally regarded as a Druidical court of judicature, probably from the conformation of the granite masses whereof it is composed. These are raised by the hand of nature, so as to form two divisions—that on the east consists of four piles of granite rocks standing at the four cardinal points, like rude bastions, connected on the E. and W. by an equally rude breastwork or curtain, but open to the N. and S. On the N.W. pile is a series of rock basins irregularly disposed over the surface of the granite mass. One, on its N. edge is complete, and is furnished with a natural lip or spout, calculated to pour the water over the edge. This basin communicates by a slight channel with a second, much broken, which has a like communication with the third, much more oval than the former, and placed E. of the second on the verge of the rock. Near the W. edge of the same rock, but detached from the others, is a fourth basin, slightly oval—depth eleven inches, diameter two feet.

N. E. of Putor, above the Walkham river, stands Vixen or Vissen tor, a natural pile, rising abruptly on the N. side from the heath, ranking from its size and form among the grandest on the moor. It faces exactly S. and is said to have been antiently employed for astronomical purposes: whether it were ever so used or not, it would at least form a colossal dial to determine the mid-day hour.

N. from Vissen tor, are the Three-staple tors, and Rolls tor—a line drawn from N. to S. would nearly intersect the five. Little Staple tor is first arrived at in ascending the hill. On the W. edge of the highest and largest mass of this tor, is a basin of irregular outline—lip nearly S., diameter two feet. On the N. W. pile of Great Staple tor, a basin less perfectly hollowed than the last—diameter sixteen inches, no lip.

Merivale bridge, adjoining which is the bound-stone of Walkhampton and Whitchurch parishes, is in the valley below.

Ascending the hill, by the turnpike road, scarcely half a mile from the river Walkham, we enter the antient town or village already mentioned. Its site is on the slope of the common, inclining to the south-west, and the ground over which the houses are scattered is of considerable extent, on both sides of the road. The principal relics in this village have been already noticed under their respective heads; and among these, the avenues by their singular appearance will immediately strike the observer. Their direction is towards the river; they are in immediate connexion with sacred circles, the northern terminating in one, and the southern having another at mid-length: they are in apparent relative connexion with the larger sacred circle and maen on the south. From these circumstances the avenues will afford the best central station for describing the position of the several relics of this antient settlement, as laid down in the accompanying plate.

About twenty-four yards S. of the S. avenue, is an imperfect cairn of small dimensions; one hundred yards S., a circle,—diameter sixty-seven feet, stones ten, height not exceeding eighteen inches. S. of the maen is the circle already described, and sixty-six feet S. of the avenue, the fallen cromlech before mentioned.

N. E. by N. of the avenues is a Cyclopæan inclosure or pound; differing essentially from Grimspound and others in the construction of the fence—this consisting chiefly though not entirely, of upright stones, while at Grimspound they are rudely piled together. Advantage has been taken of the natural position of some huge blocks in forming this singular fence; the form approaches, though imperfectly, to a circular figure; mean diameter one hundred and seventy-five feet. At the upper or E. end is a vast block—*a fair edge* forming one wall of some interior enclosure, having remains of walls at right angles. In front of this, distant thirty feet, is a large quoit-like stone, sixteen feet by nine feet eight, which as the impost, with three others, formed the group before alluded to as the possible ruins of a second cromlech of very large dimensions. There are hut circles or foundations of dwellings within, and immediately without, the inclosure, of a large size, and of the description already given, as are the other hut circles throughout the village, which extends about a mile along the side of the hill; on the highest point of which, Great Mistor (with its fine rock basin) overlooks the whole. There are many tumuli in the neighbourhood, one of which was opened, but nothing was found to repay the search.

Between the village and Great Mistor, is an old stream-work, with a primitive bridge or, rather, ford. On the summit of Great Mistor is the rock basin already described.

About S. S. E. of Mistor, above Dartmoor and Prince-town, rises Hessary tor. Southward, the land declines towards the springs of the Plym. One of the principal brooks is crossed by the Plymouth road, where an old stream-work will be observed. In the immediate neighbourhood are a number of ruined huts, four of twenty-six feet diameter, very near the road. There are many others on the slope of the opposite hill, eastward; the foundation slabs very perfect, with the door jambs standing, fronting S. North-west of these is a cairn, containing an imperfect kistvaen.

Twelve furlongs S. W. of Hessary, Black Tor rises immediately above the before-mentioned brook. On the edge of the pile on the highest ground, is a basin of an irregular oblong, two feet eight by one foot ten, with an open channel to the edge. The immense mass on which the basin is formed, rests very slightly on the tor, and has much of the logan character.

Nearly a furlong from this tor, in the glen below, are the avenues before mentioned, on the eastern bank of the stream. The N. avenue terminates in a circle, consisting of fifteen slab-like stones, the highest, three feet from the surface; ten are erect, five fallen. Between this avenue and the stream is a cairn: there is one also at the extremity of the S. avenue, but very imperfect. A stream-work intersects the avenues diagonally.

On the slope of the adjoining hill, is an inclosure or Pound, similar to those already described, of an irregular form; diameter one hundred and twenty paces. It contains nine hut circles, whose general size is twenty-six feet in diameter.

On the same hill, fronting westerly, nearly opposite Stanlake farm, is a second Pound; its form approaching to a circle, diameter eighty-six paces. Within and without the fence, are numerous hut circles. On the E. runs a brook, which appears to have been diverted from an antient channel below the Pound.

Below Colden tor, near Prince-town, is the group of kistvaens before described; and near Two-bridges, on Bair down, the maen or rock-pillar. On the banks of the west Dart, above Two-bridges, is the celebrated Wistman's wood, the venerable relics of one of the most antient forests in the world. The wood extends along the acclivity which rises abruptly from the river, nearly half a mile in length, and about a furlong in breath. The trees, which are all oaks, present a scene at once curious and interesting, from their stunted growth, and gnarled and twisted boughs matted with luxuriant moss, whortle, and parasitical plants. But although the trees do not exceed twelve feet in height, some of them are ten feet in girth, and the foliage is thick, flourishing, and vigorous.

Southward, towards Two-bridges, on the same acclivity, are numerous hut circles. Here is also a Pound of an irregular form, less perfect, but of a character similar to those in other parts of the moor. A hut circle near its lower wall, has a double foundation, different from any before noticed.

Crockern tor, celebrated by tradition as the situation of an antient stannary court, crowns the southern summit of this ridge. The tor can scarcely be said to possess any vestiges of such appropriation, although it is believed that a granite table and benches existed within the memory of persons now alive. The natural rock, however, still retains a conformation sufficiently akin to that of a chair, to warrant the supposition that it might have been appropriated as the seat of the presiding officer.

On Littleford tor is a rock basin, of an oval form; its length, to the extremity of the lip, thirty inches; breadth, twelve inches.

Between Littleford and Longaford tors, is a trackway proceeding down the hill towards the West Dart; but being much overgrown with heath, its course can be only imperfectly traced. On the declivity of the same hill, betwen the tors and Wistman's wood, are very numerous remains of trackways or lines, hut circles, and inclosures. Two dwellings are connected by a trackline; the others stand singly, and the whole number is seven. Many more appear to have been destroyed by the building of *new-take* walls.

On Chittaford down, above Post bridge, is the grand central trackway, noticed in the general description; and near it, above Goggershole head, are detached hut circles, cairns, and a kistvaen five feet square. Archerton hill, near Post bridge, boasts the singularly perfect hut above-mentioned. Here is also a Pound of a remarkable construction, thought by the observers to resemble a fortification or camp. The area is partitioned by lines of stones, in directions apparently irregular; the hut is placed near the rampart, and without it are several hut circles. The diameter of the Pound is one hundred yards. On the same hill are various relics of trackways, inclosures, and hut circles; one of the latter is very complete, and is seven yards in diameter.

Immediately opposite, on the north side of the Moreton road, is a large inclosure, which, if undisturbed, would have approached nearer to that at Grimspound than any yet examined. Diameter three hundred and fifty feet; mean breadth of the rampart sixteen feet. This inclosure contains six hut circles; without are three others, and several tracklines.

On the hill above Stanwig bottom, is a circle of ten upright stones surrounding a small kistvaen. Diameter of the circle ten feet.

Hartland tor exhibits another instance of that form of inclosure which may have assigned the area, between two or more piles of rocks, to some specific purpose. The inclosure, as at Putor, will be best described as a rude breastwork, connecting natural bastions.

Northward, on the hill opposite to Hartland tor, is a dilapidated Pound, half of the rampart having been destroyed for the purpose of building a new-take wall. The rampart is of great breadth, much like Grimspound, being in some places twenty-five feet wide, and formed of enormous stones. One entrance remains nearly S. To the rampart are joined ten hut circles, and nine are contained within the area, the diameter of which is one hundred yards. Not far distant, on a hill commanding a brook, which falls into the East Dart, are twenty-five hut circles of various dimensions.

Northward is Sittaford tor, above Ladle bottom, near which, S. E. are the circles of the Grey Wethers. On the side of the opposite hill, S. E. are numerous hut circles, connected by short tracklines of a serpentine form.

On Challacombe down, opposite Grimspound, is a line of avenues, running N. and S. The N. end is lost in a stream work; the S. is so much overgrown by heath and moss that no more than one hundred yards are discoverable. Almost all the neighbouring hills are capped with cairns, and have numerous hut circles on their sides,—as Warren tor, Birch tor, and others.

Adjoining the road, about five miles from Moreton, are some hut circles in an inclosure, one side of which is straight, the other portion forming an irregular curve. A trackway passes along the line of the inclosure, towards the valley below; at right angles to this is a second, which is lost in the valley, but re-appears on the opposite hill. There is a third, parallel to the last—all being connected with the inclosure.

Grimspound, on the N. W. declivity of Hamildown, has been already described. On the summit of Hamildown is a barrow; one of these monuments is also seen on King tor, N. E. The portion of trackway on Hamildown is supposed to be a continuation of the great trackway. On the N. E. side of Hamildown, a circular inclosure, called Berry pound, will be scarcely discernible, from the fern and heather by which it has been overgrown.

About three miles N. N. W. from Sittaford tor, is the high table land in the centre of the moor, forming an extensive morass, from which the principal streams in Devonshire take their rise. At Cranmere pool, within its precincts, is the source of the East Ockment. This swampy tract divides the water courses,—those streams which flow respectively northward, to the Bristol, and southward, to the English channel.

Near one of the springs of the Tavy, between Cranmere pool and Furtor, is a single hut of an oval form, thirty feet in circumference. Its situation is in one of the most secluded parts of the moor, and no antient remains, of any kind, have been observed in its vicinity.

Almost northernly, above the course of the Taw, rises Cawson or Cosdon hill, the highest in Dartmoor. On the side fronting Belstone church is a very perfect trackway, formed in the usual manner, with the exception of having a few stones placed erect at long intervals. Its direction is from the valley and cultivated grounds N. E. by E. four hundred and seventy paces. It terminates W. in another of similar character, meeting it in an acute angle. Near it is a dilapidated cairn.

On the ridge of the mountain, N. from its highest point, is a cairn, inclosed by a fence of slab stones, closely set, leaning outwards, apparently, so placed, by design. The highest of these inclosing stones is three feet, and the object seems to have been, to confine the small stones, of which the cairn is composed, within their compass.

S. W. sixty-four paces, a cairn formed of unusually large stones, contains a kistvaen, seven feet square,* already described. W. S. W. seventy paces, is a large circle, constructed of closely set slabs, like all the habitation circles on the moor, but considerably larger than any hitherto noticed. Its diameter is fifty feet, and if the smaller ruins convey a notion of the cabins of the people, this from its size bears the appearance of the mansion of the chief. Yet in the centre is a fallen kistvaen, eight feet square, within which we thought we could discover a rude sarcophagus, the cover of which was not more than two feet and a half in breadth. This relic altogether, if not unique, is of a very singular character, and very distinct in its appearance from all others we have met with.

S. W. of the last, one hundred and twelve paces, adjoining the beacon-cairn on the mountain top, is a low, circular inclo-

* This is probably 'Cawson house,' of which the moormen in the neighbourhood speak.

sure, in formation somewhat similar to the tracklines. The stones are thrown promiscuously together, a very few only being placed erect in the ground. With the exception of a small portion of its circumference, this circle is beautifully perfect; inclosing an area of boggy land, scarcely lower than the highest point of the mountain upon which the beacon is placed.

In the descent of the hill, towards Taw marsh, opposite Belstone tor, is a group of hut circles, nine in number, within and without a trackline inclosure, three hundred and forty paces in circumference. One part of the circumference breaks from the circular into a serpentine form, for no apparent reason. Still nearer to the valley of the Taw, on the side of the mountain, two trackways intersect each other, forming acute angles at the point of intersection. The trackways can be distinctly traced two furlongs from N. E. to S. W.

Four miles S. E. of Cawson, is Castor rock, which has a basin two feet by one foot six. Immediately below Castor, on Tincombe* down, are numerous tracklines, rectangular inclosures, and Pounds, with hut circles, similar to those in other quarters of the moor.

Near Castor is Gidleigh common, on the borders of which is an upright rock pillar or maen, similar in appearance to that at Merivale bridge. The height is twelve feet, girth at the base eight feet, tapering gradually upwards. It has been employed as a bound-stone, and inscribed with the letters G and D—*Gidleigh and Dagleigh commons.* Thirty-six yards from this stone, commences an avenue of upright stones, one hundred and thirty-four yards in a direction N. and S. At some distance, on another part of the hill, is a second avenue running down the hill one hundred and forty yards, in a

* Correctly, *Teigncombe*, without doubt.

direction due N. and S. The breadth is four feet and a half, and it terminates in a very curious set of circles of upright stones, placed one within another; the outermost consisting of eleven stones, the second of six, the interior of eight; and within this, three stones, irregularly placed. Diameter of the whole fifteen feet. At a short distance is a columnar stone, having the appearance of an overthrown maen.

A few paces from these concentric circles commence a pair of avenues, leading down the hill, N. towards the Teign. The eastern of these avenues could be traced only forty-one yards, but the stones are peculiar and unusually large, some standing three feet six from the surface, and being of a triangular shape. The western is visible one hundred and forty-four yards; in a direct line from its termination, are two upright stones, two feet six high, and ten feet apart.

N. of the Teign is the fine Gidleigh circle, before noticed, on the declivity of a hill, above the North Teign; and near a path leading from Venworthy to Oakhampton, N. of Castor rock, and E. of Watern tor.*

On Ruggamede hill, in Venworthy new-take, one mile and a half from Gidleigh pillar, is a circle of upright stones, twenty-seven in number; the highest standing three feet and a half from the surface. From some wide intervals in the circumference, the stones appear to have been removed. Diameter sixty-four feet.

S. of the circle, three hundred and sixty feet, commences an avenue, taking a direction N. and S. one hundred and twenty-four feet, towards a brook. A large part of this avenue seems to have been removed, for the construction of a neighbouring wall.

* Remarkable for Thirlstone rock, containing an aperture said to be large enough to admit a man on horseback.

Assacombe hill, overlooking a spring of the South Teign, has various relics, though chiefly in a more dilapidated state than usual. The adjacent fences too evidently account for the more than ordinarily ruinous state of the hut circles, and quadrangular inclosures on this spot.

In the neighbourhood of Venworthy, tracklines will be found, forming irregular figures, (and containing hut circles,) of a similar description to those on Lakehead hill.

Bowerman's nose stands on the promontory of a long ridge of hills, dividing the vales of Manaton and North Bovey from that of Widecombe. Below, is a road to Chagford, from which town, in the direction of Holy-street,* a lane leads to the celebrated Drewsteignton cromlech, in a field belonging to Shilston farm. S. of the cromlech, eighty-seven feet, are the remains of what has been regarded as a tumulo-cairn, with an excavation in the centre.

N. N. W. of Sandypark, a rocky ridge rises from the coppice and marshy grounds around it; tors appear on the summit, two of which have rock basins. The most perfect is very deep, and nearly circular, being two feet by one foot eight.

S. E. in the channel of the Teign, is the logan stone mentioned in the general description; and near Manaton church-town the large circle, also before described.

In the ascent of the hill above Becky fall, and opposite Lustleigh cliffs, is a large dilapidated cairn, with a trackway descending from it, towards the valley N. E. two hundred and thirty-six yards.

On the eastern pile of Heytor, is an imperfect basin, two feet

* Called by Polwhele, the *Via Sacra* of the Druids.

six in diameter. A trackway, running N. E. terminates at the west pile; a second, parallel to the last, ends in a smaller tor, W. of the great tor. Another, intersecting the second, has for some distance the appearance of an avenue, two hundred and thirty-six yards long, but gradually dwindling into a line; having at its southern end a trackline, at right angles.

N. W. of Heytor, Holwell tor presents a walk of one hundred yards, at least from one hundred to one hundred and fifty feet wide, between walls of granite, rising to one hundred feet in the highest part. Below Rippon tor, the second of the Dartmoor hills, a trackway forms an object so conspicuous, as to be taken at first for a modern fence. Descending the side of Rippon tor, it crosses a road leading from Heytor, and the road from Ashburton to Chagford. Many of the stones in this trackway are unusually large and high; presenting, from this circumstance, more of the fence, and less of the causeway character, than any before noticed. Near the trackway are two hut circles, the slabs of which are large and closely set; the largest, thirty feet diameter; the other circle eighteen feet diameter, having one door-jamb, four feet high; the former containing a dilapidated kistvaen.

Torrhill, W. of the trackway, has its declivity partitioned into rectangular inclosures by tracklines; many of these inclosures contain hut circles.

A circular inclosure, as large as Grimspound, occupies one portion of the face of the hill, and contains hut circles. Both the hut circles and inclosure are much dilapidated, and one fourth of the eastern circumference of the latter has disappeared. The western side of the hill, looking towards Widecombe, has some circles of erect stones, closely set, in the act of being demolished, for repairing the road!

The road to Chagford runs along the high moorlands, above

Widecombe church-town, adjoining which, a trackway may be traced, pursuing the same direction.

Yartor, on the opposite side of the dales of Widecombe, looks down upon Dartmeet bridge, the point where the parishes of Widecombe, Holne, and Lidford meet. This tor has two courses of natural rock, (similar to Putor) on the north and south. The west side has a low rude fence, formed of granite blocks; and the eastern has a similar breastwork, though less perfect, and somewhat in advance of the parallel courses on the other sides of the tor. The whole conformation presents a rude but grand inclosure, conveying the idea of a natural temple, admirably adapted to the wild and mystic rites of a dark and superstitious worship.

From Yartor, N. E. are some hut circles; one of which contains a kistvaen in ruins, the cover-stone of which is five feet by three.

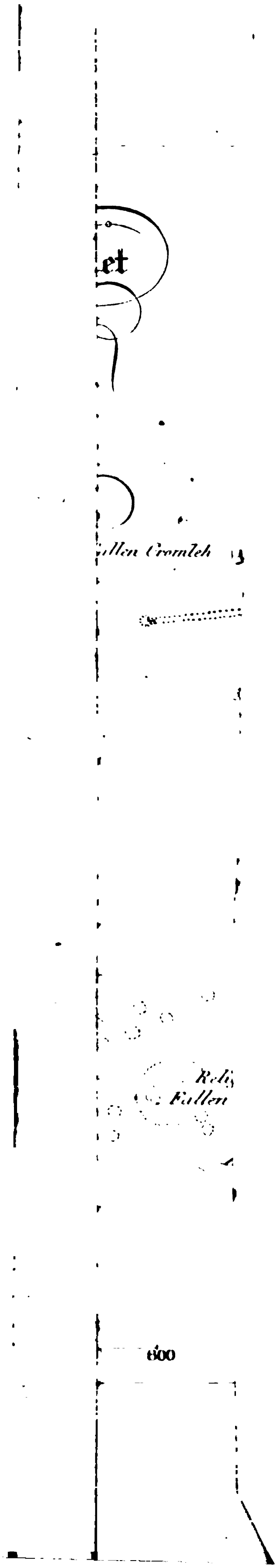
Near the springs of the Erme, and not far from the old road called Abbot's way, is Erme Pound, an inclosure of similar character to the others already described. S. S. E. is Three-barrow tor, so named from the three enormous cairns on its summit. The cairns are observed to be generally of larger dimensions in this quarter than in other parts of the moor, and there is scarcely a hill in the neighbourhood, which cannot boast of its granite crown. At its western foot is an extensive group of hut circles, of large size, and less disturbed than in many other places. Many of them have inclosures attached, conveying the notion of a yard, or garden plot. One is double, the circles touching one another, but there is no appearance of an opening or communication between them. N. of this spot is a Pound, and another conformation of a similar character, not so well defined.

Southward, about one mile from the Western beacon, in a fine mountain basin, is a double avenue, so nearly obliterated as to require a practised eye to detect it. It terminates in a stream, and is unconnected with any other British relics.

On the hill above Shavercombe head, near the springs of the Yealm, are some detached hut circles. On Shaugh moor are also some circles, about a mile east of the church; and on Sheepstor, which rises grandly above the church-town of that name, are hut circles and a rock basin.

There are detached hut circles on Cockstor, W. of Staple tor;—a straggling village with inclosures, on the Walkham, below Mistor, (the largest of which is ninety-three paces in diameter, each inclosure having a hut circle on the western edge;)—a trackway between Mistor and Rollstor, near an antient road to Lidford; tracklines and other remains below Lints tor;—but as these have not been so accurately examined as the other relics which came under our notice, a particular description cannot be given.

We are not, however, without the hope of pursuing these investigations on a future occasion, and of completing an enumeration of British relics in Dartmoor, and its precincts.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VII.

ON PERSIAN POETRY—BY MR. NATHANIEL HOWARD, HONORARY MEMBER OF THE PLYMOUTH INSTITUTION.

The difficulty of writing on Oriental subjects, particularly in this country, arises, in a great degree, from having so little access to manuscripts, and from the paucity of publications connected with the literature of the East. I feel much diffidence in entering on this dark and extensive region; but trust from this avowal, great allowances will be made, especially if it be considered, that not more than half a century has elapsed, since the strong efforts were made by that accomplished Orientalist Sir William Jones, to excite a popular taste in the British nation for the literary productions of Asia; and since his time, the march of Oriental learning, though not rapid, has been progressive. It is true, that a few Europeans have been eminent in Arabian learning before this stated period; but it was reserved for the genius of Sir William Jones, to shed a more general lustre on the languages of Asia.*

* Much valuable information may now be expected from the Transactions of the Royal Asiatic Society of Great Britain and Ireland, in conjunction with the Branch Societies in India; also from the Oriental Society of Translation, which has recently been established in London.

Before we can speak satisfactorily of the poetry of *Iran* or Persia, it is necessary to take a rapid view of the state of Arabian poetry before, and about the time of, the Mohammedan Conquest.

The compositions of the old Arabian poets, preserved in a written form, are more or less descriptive of their primitive manners, of their tents and camels, of their deserts and pastures. Love and Pity, the two keys of the human heart in the poetry of all nations, impart an irresistible charm to the shorter pieces of the Orientals. Their *gazels*, generally expressive of gay and lively images, and their *casidahs*, appropriated to serious and grave subjects, are without number: many of their productions breathe a fine spirit of independence; inculcate a noble contempt of riches; and are profuse in praise of liberality, a virtue for which the Eastern nations are pre-eminently distinguished.

Some authors imagine that the *art of writing* was not much in practice among the Arabians before the time of Mohammed, who on account of his ignorance of the *written* character, was styled by his enemies "*The Illiterate.*"* This ignorance perhaps extended only to the kind of writing introduced just

* It has been suspected that the term "*Illiterate*" was purposely assumed by Mohammed, or given to him by his friends as a pretended proof of the Koran being of divine origin. M. Renaud in his "*Description des Monumens Musulmans,*" observes that Mohammed was fond of retirement, and that every year, during the month of the Ramadan, he withdrew to a cave on Mount *Hira* near *Mecca*, and declared, that in his meditation on divine subjects, he was visited by the angel Gabriel, who saluted him with the title of "Apostle of God," and, "as he knew uot how to read, at least at first, the angel brought his instructions in writing, and read them to him. Mohammed repeated them, and afterwards revealed what he had learned to his disciples. Hence is the origin of the term *coran*, which in Arabic means *reading*, and is pronounced with the article, *al-coran*, which implies, emphatically, "*the reading.*" Asiatic Journal for Jan. 1829.

before *Islam** by Morámer Ibn Morrah, a native of Babylonian Irák, which was named *Ambary*, and superseded the *Almosnad*,† a character in use before the establishment of Mohammedanism amongst the Hamyarites, or the people of Yemen, governed by princes of Hamyar, and professors of Sabeism. This character was most probably the rude *Cufic*.‡ The learned Silvestre de Sacy thinks it impossible to imagine that

* *Islam* or *Islamism*, "from the word *salama*, which in the fourth conjugation is *islama*, to enter into the state of salvation; hence *eslam* (or *islam*) the saving religion; and *musliman*, or as we call it, *musleman*, he that believeth therein." Prideaux's Life of Mohammed, page 15. *Musulman*, according to M. Reinaud, signifies "to put oneself into the hands of God."

† *Almosnad* or *Musnad*. Nous n'avons, sur les caracteres musnades que des notions vagues et incertaines. . . . . Je crois aussi que les caracteres musnades etoient les memes que ceux que nous voyons sur certaines bandelettes de momies. Les auteurs arabes qui parlent des antiquites de l'Egypte, l'affirment meme tres-positivement; ils nous apprennent en meme temps que ce caractere etoit usite anciennement chez les Hhemyarytes. L'ecriture musnade, dit al-Masoudy *(Mouroudje al dseheb)* est la premiere ecriture des Hhemyarytes et des rois de A'ad. Al Maqryzy (Descr. de l'Egypte, article des Pyramides) ajoute que les lettres en sont isolees. Hhadjy Khalfah (Bibl. Orient. article *I'lm el-Khath)* et Pocock, nous representent, au contraire, ces caracteres comme groupes. Ces deux opinions ne paroissent pas contradictoires, quand on examine les bandelettes dont nous venons de parler." Recherches Asiatiques Tom. Sec. p. 14.

‡ So called from *Cufa* or *Coufa* where it was first used. The character termed *Cufic* was introduced by Moramer. Ibn Khalcan, an Arabian writer, thus observes:—"With respect to the practice of the art of penmanship, the first who ever wrote in an Arabic character was Ismael, on whom be peace. The true opinion, however, according to men of learning is, that the first writer in an Arabic character was Moramer Ibn Morrah of the people of Ambar. And it is said, that from the sons of Morrah and from Ambar writing was spread among our countrymen." See also on this subject Professor Stewart's "Original Persian Letters," page ii. a work of great importance to writers and other students going to India. His version of the seventh chapter of Anvari Soohyly, and his other publications have considerably enlarged our knowledge of Persian literature.

all the tribes of Arabia continued without the knowledge of writing until the sixth century of the Christian era, and also remarks, that as the old *Cufic* character bears so great a resemblance to the ancient alphabet of the Syrians named *Estranghelo*, there seems to be no doubt that the Arabians borrowed it from the people of Syria; and this opinion is further confirmed by historical traditions: and as the Korán was originally written in the rude *Cufic*, or rather in the anterior character borrowed from the Syrians of Mesopotamia a little before the time of Mohammed, he very justly conceives that the character, then introduced, spreading through every part of Arabia with the doctrine of the Prophet, caused all other kinds of more ancient writing to fall into disuse.* It may also be here observed, that Arabic may easily be written with Hebrew characters.†

The *Cufic* laid the foundation for the *Niski*, a beautiful character in use about three hundred years after Mohammed, ascribed to Abu Ali Ibn Moklah, but it was considerably improved and perfected about the year of the Hijra 423‡ by Ibn Bowab. This character was afterwards embellished by

* See M. de Sacy's *admirable* Grammaire Arabe. Premiere Partie. p. 5. See also Note to Mills's Mohammedanism, page 381, where references are made to Pocock. Specimen p.153, Niebuhr tom. 1. p. 38.

† See Memoir of the Rev. Joseph Wolf, p. 211, M. Langles speaking of the learned Pocock, thus observes: En 1655, il publia le *Porta Mosis*, ouvrage compose en arabe et ecrit avec *des caracteres hebreaux*, par le savant Juif Moise Maimonides, sur l'histoire et la nature du Talmud. C'est le premier livre imprime a Oxford avec des caracteres hebreaux. Recherches Asiatiques.

‡ An. Dom. 1030. *Ibn Khalcan;* but according to Abulfaraji 413, or An. Dom. 1022. *Hijra* or *Hejira* signifies *flight*, alluding to the *flight* of Mohammed to *Yatreb*. and this circumstance according to M. Reinaud, produced a change of its name to *Medinet al-Nabi*, "the city of the prophet," or simply *Medinet* or *Medineh*. It occurred in the year 622 of our era, and has since been employed as an epoch by all Mussulman nations.

Nezam, Tograi,* Yakût, and other eminent penmen. The Persians are fond of the fine *Talik* hand, particularly in Poetry; but the *Shekesteh* is an inelegant and careless kind of writing without regularity, and often without diacritical points.

A very ancient *cuneiform* character has recently been discovered by M. Schulz, inscribed on the monuments in the city of *Van* in Turkish Armenia, which the natives call *Shamiramakert*, or the *city of Semiramis*. This *cuneiform* character the learned M. St. Martin considers as belonging to a very remote antiquity, and identically the same as that found in the Inscriptions on the walls of Persepolis; some of which he so ably interpreted. He is of opinion that this system of writing expressed the sounds of a dialect closely connected with the *Zend*, and which dialect was the ordinary language of the Persians at the time of the elder Cyrus. Other inscriptions have also been discovered by M. Schulz in the city of *Van*, which are different to the character which M. St. Martin denominates Median and Assyrian, but possessing a strong affinity with it, and referable perhaps to a higher period of antiquity.†

The copiousness and extent of the Arabic language is a subject of astonishment to those, who have not duly considered the rapid productiou of words from roots generally triliteral, (though quadriliterals in Arabic are also numerous,) and in a language which abhors compounds. Sir William Jones has calculated that twenty-eight Arabic letters will give nearly twenty-two thousand elements of the language; he also informs

* *Tograi* is the author of a favorite monody of fifty-nine couplets, well known to Arabic scholars.

† See more on this subject in the Asiatic Journal for Dec. 1828.

us that the Arabians have a saying "that no man uninspired was ever a complete master of Arabic."*

The difficulty of attaining an extensive knowledge of the language, and writing it accurately, are discouraging obstacles even to a native; for the incredible fund of words,† from which a judicious and practicable selection can be made, is at once an overpowering cause of perplexity: besides which, the critical propriety in the arrangement of sentences, the nice felicity of idiom, and the easy elegance which a skilful and experienced hand alone can throw into a written composition, are within the reach of few.

Specimens of poetical, or of any other literature of Arabic origin, existing at the important era of *Islam*, are mostly in manuscript, and only to be found in the libraries of Universities, or in private Collections, if we except the publication of the *Moallakat*‡ or the seven celebrated poems, of which Sir William Jones produced so excellent a version in our own language; the extracts by Schultens from the Hamása, which is a valuable collection of ancient poems compiled by Abu Timmam, and of which a complete edition with a Latin version and commentary is now in progress, undertaken by Professor Freytag; the Monumenta Vetustiora of Schultens; the Casidah of Caab Ibn Zoheir; some pieces scattered in the works of the

* Sir William Jones's Discourse on the Arabs.

† Pocock, in his preface to the *Carmen Tograi*, mentions a circumstance, which, (if true,) may give some idea of the pains which the Arabians have taken with their language. "A king having sent to a grammarian for the books in his possession relative to that tongue, he desired the messenger to inform the monarch, that if he wished to have them, he must send sixty camels to carry the dictionaries alone." This sounds like *an Arabian Tale*, but see Richardson's Dissertation on the literature &c. of the Eastern Nations. *Proofs and Ill.* p. 74.

‡ *Suspended.*

learned Baron de Sacy and Reiske; and others to be found at the end of Carlyle's elegant translations. But a happier era seems to be dawning on the literature of Arabia, and accurate editions of some of the best works of that country may reasonably be expected.

The specimens of the seven poets,* usually styled the "*Arabian Pleiades,*" are masterpieces of Arabic poetry, and are said to have been suspended in the portal of the *Kaaba*, or Square Temple of *Mecca*, as models of beauty and elegance.†

The Arabians appear early to have been enthusiastic lovers of poetry. It was really with them the natural expression of passion. It was the solace, the gratification, or as the Asiatics term it, the *lawful magic* of their uncultured minds. Their

* The seven poets are Amralkeis, Tarafa, Zoheir, Lebid, Antara, Amru, and Hareth, who flourished in the seventh century of the Christian era. Some valuable editions have appeared of nearly all the Moallaka, accompanied with the commentary of Zuzeni, which is thought preferable to the scholia of Ibn Nahas.

† The practice of *suspending* poems at the gate of the *Kaaba* seems to be for the purpose of obtaining *publicity*, as Mecca was the resort of pilgrims and the chief place of trading with caravans; if they were suspended *within* the temple, it was done with a view to the *preservation* of the manuscripts. The poems, honoured by the prize obtained in the poetical contests at *Ocadt*, were usually written on Egyptian silk, in letters of gold, and in due form hung on the gate of the *Kaaba*, a temple so ancient, that its age is lost in a cloud of idle traditions. The learned M. Langles says:—Long temps avant Mohhammed, les Arabes avoient chaque annee, dans la plaine de O'kadt, pres de la Mekke, des assemblees assez semblables aux jeux olympiques des Grecs: on y disputoit devant une multitude immense, non seulement le prix de la force, du courage, de l'adresse, mais encore la palme de la poesie et de l'eloquence." &c. Recherches Asiatiques, Tom. ii. p. 18. Sir William Jones informs us, that in Pocock's collection of manuscripts at Oxford, No. 174, there is a MS. containing above forty other poems, which had the honour of being *suspended* at the gate of the temple.

pastoral occupation, their familiár view of natural objects, their desert solitudes, their regions of burning sand, their rugged hills and beautiful valleys—all contributed to touch the chords of nature within them, and the expression was a spontaneous flow of poetry and musical cadence.

The Arabians have excelled in almost every species of poetical composition; but their genius mostly delighted in the lyric and elegiac. They have also successfully exercised their talents in satirical, didactic, and narrative poetry.—Among their most valuable productions which have escaped the havoc of time and proscription, we may mention the Aghany,* a complete collection of ancient Arabian poems, the diwan of Hudhail, the two Hamásas, one by Abu Timmam already mentioned, the other by Albakhteri, the diwan of Dhu'lremmah, the poems of Amrulkais, Mutalammis, Jarir, Ferezdak, and others. The volumes of the more modern Arabian poets, still in manuscript, are exceedingly numerous; but till the best of these works have seen the light, no fair estimate can be formed, nor any clear view given of the poetry of Arabia.†

* "M. Jones oublie de citer la collection la plus complete d'anciennes chansons arabes, intitulee *Aghany*; la Bibliotheque nationale en a dernierement acquis un bel exemplaire en quatre gros volumes *in-folio*." Recherches Asiatiques. Tom. ii. p. 29.

† Best of the more modern Arabic Poets still in MS.

Abu Nawas Al Hassan Ibn Hati, born A. H. 145, died A. H. 195. MS. Bodl. 170. pp. folio.

Abu Timmam Habib Ibn Awas Al Tai, born A. H. 190, died A. H. 231.

Abu Ibadah Alwalid Ibn Obad Albohtari, born about A. H. 200, died about A. H. 280.

Abu Ibnul Abas, surnamed Ibnulrumi, died A. H. 283. MS. Bodl. 300. pp. 4to.

Abu Tayed Ahmed Ibn ul Hussain Almutannabi, born A. H. 303, died A. H. 354. MS. 8vo. 311. pp.

Abu'l Ola Ahmed Ibn Abdallah Altanukhi Almaari, born A. H. 363, died A.H. 449. MS. 300. pp. 8vo.

As a specimen of an ancient Arabian poem, I present a manuscript version which Sir William Jones wrote in his fine copy of the Hamása, now in the library of the Royal Society. "In the night-watch, past the midnight hour, a turtle-dove mourned on the branch: *and I was sleeping!* I spoke falsely by the mansion of Allah: had I been really a Lover, the turtles would not have preceded me in amorous mourning."*

Sir William Jones has also left the following prose version of another short poem in the Hamása by Abú Atai'ssindi, surnamed Marzuk, a Moslem. "I remembered thee, *my fair one*, while the Indian javelins were vibrating among us, and the straight brown lances were drinking *blood* from us. Now by Heaven! I know not—and I am a speaker of truth, whether a disorder has affected me through thy removal, or whether it be enchantment. If it be enchantment, excuse me in the name of Love: and if it be a disorder of a different sort, with thee must be the excuse." †

Amidst all the contests for literary excellence, the spirit of religious animosity was secretly working its progress to the

* These lines may be thus rendered into verse, but it is impossible to reach the beauty of the original.

> In the still night-watch, where I lay,
> A Dove sat mourning on a bough,
> *And I was sleeping!*—Can I say
> I lov'd that Fair One, yet could prove
> So false, O Allah! to my vow?
> Alas! I am no Lover—else that Dove
> Had ne'er preceded me in notes of Love.

See Appendix to Original Passages—No. 1.

† See Appendix No. 2.

very centre of Arabian idolatry!* Continued feuds among the different clans had long agitated that divided country, and led the way to a revolution in the national worship. Arabia had early afforded an asylum to unprotected Jews and persecuted Christians, who were allowed to exercise the rites of their respective religions unmolested. Mohammed, taking advantage of opposing factions and the general disorder, and being gifted with all the arts of insinuation,—an eloquent tongue—a graceful figure—an enthusiasm of manner—an unshrinking perseverance through difficulties, after years of protracted opposition to his new faith, at length pushed on his conquests, first by persuasion, and during the last ten years of his life by the power of the sword, and lived to see his doctrines strike root in every part of Arabia. This religion after his death, sent forth branches which extended, by the means of political influence, over Syria, Persia, Egypt, Turkey, Morocco, and many other nations of Africa. The *Kaaba* was again revered as the ancient seat of sanctity. No more were rival poems of acknowledged excellence allowed to decorate the portal of the temple. Nothing was permitted to meet the public eye, which might impugn the new faith, or obscure the splendour of the Koran, which, as the Prophet and his successors pretended, was of divine origin.

The fervour of conquest, and the fanaticism of zeal to disseminate in neighbouring countries the Moslem faith, produced to the Arabians a series of brilliant victories.

* "Mecca, in particular, and most of the tribes, having deserted the faith of Abraham and of Ishmael, had plunged into all the errors of paganism. In the interior of the Caaba were statues of Abraham and Ishmael holding seven arrows, with which the idolaters pretended to tell future events. On the outside were ranged 360 statues, each presiding over one day in the year; some represented angels, others planets and stars. Every one had its peculiar form of worship, its votaries, and sacrifices." See Abridgement of M. Reinaud's Musulman Monuments in Asiatic Jour. Jan. 1829.

The battle of *Cadessia*, in the year 636 of the Christian era, decided the fate of the Persian monarchy. It gave the death-blow to their expiring greatness. The elegant and polite Persians were compelled to submit to the yoke of Mohammedanism. By this disastrous overthrow their literature sunk, and their civil polity was levelled to the ground. In the confusion, fanaticism, and devastation which followed the introduction of Islam into the classic land of the Persians, not only were their early annals lost, but even their soft and beautiful language was corrupted by an influx of discordant Arabic words, to which their ears were unaccustomed, and which their organs of speech were incapable of uttering.* Almost every vestige of literary composition which preceded this extraordinary revolution was swallowed up in the vortex of those tumultuary times: and here, we must not omit mentioning the destruction of the Alexandrine Library, by order of the Calif Omar, when Amrou subdued Egypt, (seven centuries after the destruction of the celebrated Library of the Ptolemies, which occurred in Cæsar's time.) This Library consisted of an immense number of volumes, sacrificed to the infatuated zeal for the exclusive promulgation of the Koran. The fact rests on the authorities of Abul-faraji, Macrisi, and also of Abdollatif, a writer of a work expressly on Egyptian antiquities.†

In contemplating the fate of the extensive, and once mighty empire of *Iran* or Persia, the mind is awed and overpowered by a variety of emotions; and if we can but divest ourselves of the partiality, which with our earliest dawn of reason, we have imbibed for the greatness, valour, and literature of the Greeks and Romans, we shall be better able to appreciate the

* The Arabic letters are difficult of pronunciation to the Persians, particularly (tha) *th* which they pronounce as *s*, and (dhal) *dh* they sound as *z*.

† See note to Mills' Mohammedanism, page 381. See also Gibbon's Account of the Fate of the Alexandrine Library. History of the Decline and Fall of the Roman Empire, vol. 9.

genius, glory, and literary distinction, which characterised the Persians from the remotest periods of antiquity, and which diffused an enlightened and beneficial influence over the whole continent of Asia. When we survey this celebrated empire, whose monarchs "reigned from India even unto Ethiopia, over a hundred and seventy and twenty provinces;"* when we reflect upon its ancient grandeur, its princely dependencies, laws, manners, literature; at one time a stately and commanding people steadily promoting their own power and prosperity, at another time torn and convulsed with a series of civil dissensions, we shall be presented, as in a mirror, with the uncertainty of national greatness, and the violent catastrophes, which usually follow the desolating career of revolutionary governments.

The promulgation of the doctrines of the new faith, the proscription of all efforts of the imagination, which were not in unison with the tenets of Islam, and the opinion that all knowledge was contained in the Koran, interrupted for some time among the Arabians, the progress of Poetry,† until the accession of the Abassids, who warmly encouraged the revival of art and letters; among these, the celebrated Haroun Alrashid, the fifth of the Abassid Khalifs, in the 170th

* Esther, chap. 1. ver. 1. Chardin informs us that "Persia is the greatest empire of the world, if we consider it according to the geographical description of the Persians." "As to the ancient empire of the Persians, it reached from the *Hellespont* to the mouth of the river *Indus* about two thousand eight hundred English miles; in breadth from *Pontus* to the mouth of the Arabian gulph about two thousand miles." Universal History, vol. 5, p. 52.

Modern Persia is comparatively in a very degraded state. See Fraser's Khorasan, Morier, and other recent travellers.

† The following protest in the Koran against poets is curious: Shall I declare unto you upon whom the demons descend? They descend upon every lying person; they learn what is heard; but the greater part of them are liars. And those who err, follow the steps of the *poets*." Sale's Alcoran, chap. 27.

year of the Hijra, (A. D. 786) became illustrious for his patronage of letters, and had the happiness to see his Court at Bagdad crowded with men of genius and science, who were invited from all parts of the world to share his munificence.

During his splendid reign, the Khalifat rose to its highest pitch of greatness; for its power "extended in Asia from the gulph of Persia and the confines of Tatary* to the Mediterranean and Indian Seas, and comprehended all the habitable part of Africa, from the isthmus of Suez to the Atlantic ocean."† Haroun having enjoyed a reign of twenty-three years of uninterrupted glory, died, and left the throne to his eldest son, Amin, who, being a weak and unamiable prince, was put to death by the army; and Al-Mamun, his younger brother, was declared Khalif, amidst the unanimous acclamation of the people. He was the seventh monarch of the Abassids; and, in his time, poetry and the sciences attained their zenith of excellence. Though his power was less formidable than his father's, and the splendour of his court, perhaps, inferior, yet he was more passionately devoted to literature, expended larger sums in the acquisition of valuable manuscripts, and was more zealous for the diffusion of general knowledge. Poetry, Astronomy, Mathematics, Natural History, Medicine, and other species of learning, mostly derived from Greek authors,‡ spread over every country, where the power of the Khalif was felt and acknowledged.

* The Chinese, having no *r* in their alphabet, pronounce *Tata*. It does not appear that this term was known in Europe before the twelfth century.—M. Langles.

† Carlyle's Specimens of Arabian Poetry.

‡ "At the commencement of the ninth century, the Arabians were acquainted with the medicine, philosophy, and natural history of the Greeks: they possessed translations of Hippocrates, Galen, Theophrastus, Ptolemy, Euclid, and Aristotle."—See an excellent article on Arabian Literature in the fifth number of the "Foreign Quarterly."

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* Esther, chap. 1.
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All, without distinction of rank or condition, as if influenced by the spirit of chivalry, challenged each other to a trial of their skill, under the graceful banners of Poetry and Eloquence.

Amidst all this princely patronage and literary competition, many poems of acknowledged excellence must have been produced; but not a vestige of Persian origin of any importance has descended to us prior to the *Shah nameh* of *Firdausi*,* although we read of other poets who were in high repute before this period. But who can predict what specimens of Oriental genius may yet be discovered, at a future period, under our enlightened polity in the East, and liberal encouragement given to literary inquirers? It is not unreasonable to suppose, that some valuable manuscripts in the sacred *Zend*,† or courtly *Deri*, or ruder *Pehlevi* dialect of Irân, may have escaped Mohammedan proscription; and may still exist in many parts of Asia, in the seclusion of libraries, or in the neglected depositories of religious edifices. Such works either of an historical or poetical nature would be highly desirable; and it is rational to expect further discoveries of Persian works, or more correct copies of those already known, when we consider what great efforts have been made, within a few years, for the developement and diffusion of Sanscrit literature.

* The Persian translation of Tabari's *Tarikh Kubir*, an historical work, is supposed to have been made Anno Hijræ 350, A. D. 961, some years before the appearance of the *Shah nameh* by Firdausi, who died A. D. 1020. See Orient. Coll. vol. ii. p. 187, a work full of interest and learning to the Oriental scholar.

Tabari's Great Chronicle is about to be published by Professor Kosegarten, of the Oriental chair at Greifswald, with a Latin translation and learned notes. See Foreign Review, No. 3.

According to an article in the Edinburgh Review, for 1816, the Persian translation of the "*Dusateer*" is a very ancient specimen of the language. Vol. xxvii. p. 200. *Note.*

† This refined dialect was cultivated with great assiduity at the court of Beharam Gur, in the year 351 of the Christian era, to distinguish it from the *Pehlevi*, or language of the country.

Among others, the learned Mr. Horace Wilson, of Calcutta, has enriched the world with a recent translation of several fine specimens of the Indian Drama, a valuable Sanscrit Dictionary, a poetic version of the Megha Duta, and other publications: to his extensive knowledge of Sanscrit as a scholar, may be added the classic and high qualifications of a poet. It must, however, be remembered, that the first European, whose genius broke through the barriers of Sanscrit learning, is Dr. Wilkins, to whom the Oriental world of letters is so deeply and lastingly indebted.

About the close of the tenth century of the Christian era, Sultan Mahmud reigned in the city of Ghezni. He was an illustrious patron of learned men; and having acquired glory by the success of his sword, (for he was supreme ruler of Zablestàn, and part of Khorasàn, and had penetrated very far into India,*) he turned his whole attention to the aggrandisement of his country, and to the cultivation of useful knowledge. He framed a project of collecting into one great and national poem, all the reigns of the Persian monarchs from the earliest times; and gave directions to search into every accessible depository for chronicles and records, connected with the history of Iràn. By a happy accident, a valuable manuscript was discovered admirably calculated for this purpose, containing in one view, all the memorable facts and events from the time of Kaiúmuras, the first king of the Peishdadian dynasty, down to the reign of Yezdejird, with whom the ancient race of the Persian kings became extinct. This rescued work is known by the name of *Siujurul Moluk*, or the *Bastan nameh*, and is said to have been found in the plundered library of Yezderjird; and since that time, to have passed through different hands in Arabia, Ethiopia, and Hindoostan. But, whatever might be the true history of the manuscript, the Sultan was furnished with a copy of it; and seven of the best

* See Sir W. Jones's "History of the Persian Language."

poets were engaged in versifying the work; but it was reserved for the genius of Abul Cassem Hasan ben Mohammed to execute this vast undertaking. The ardour of his mind was undiminished in the progress and accomplishment of this noble work; and after many years of close application, the *Shahnameh* was completed.* It astonished the eastern world of letters. Mahmud ordered an elephant load of gold to be presented to the author, and also honoured him with the surname of *Firdausi*, as having diffused over his court *the delights of Paradise*—the word *Firdaus* signifying *Paradise*. But it appears that Firdausi had enemies at court; and the chief minister, Ahmed Mymundi, was bent on the ruin of the favoured poet; in short, Firdausi fell under the displeasure of Mahmud, and never received the expected reward of his labours, but a present totally inadequate to his merits. He wrote a recriminating and bitter satire on the injustice of the Sultan, and fled from his dominions. This celebrated satire breathed, in glowing language, the most exalted sentiments of a man conscious of his own rectitude; and under the conviction, that independence of mind is not to be intimidated by the arbitrary will of power.†

Allured in youth by the glare of poetical fame, and panting to participate in the capricious favours of the Sultan, this extraordinary man begged the holy benediction of his aged priest, and exchanged the quiet of his native city Tûs, in Khorasân, for the more attractive, but more troublesome, splendour of the court of Ghezni. From this period to the

* It occupied the poet thirty years, and was completed in the 384th year of the Hijra, (A. D. 994.) This poem has been translated into Arabic prose by Al Fetah ben A'ly al-Hendary, native of Ispahan, for the great king I'yqa ben el-A'adel Aboubekr ben Ayyoub, and finished in 675 of the Hijra. (A. D. 1276.) See Mons. Langles' Notes to the Recherches Asiatiques, p. 33, tom. ii.

† See a fine extract of this satire in Sir William Jones' Poeseos Asiaticæ Commen. Caput xvii.

time of his death, he appears to have been the favourite of princes, the envy of courtiers, and the sport of fortune. His fondness for an only daughter is particularly instanced, and the height of his ambition was to place her in the first circles of rank and fortune: and this circumstance is all we at present know of his domestic character. The period of his death is not precisely ascertained. Sir William Ouseley fixes it in the year of the Hijra 411, (A. D. 1020.)* In the satire against Mahmud, he acknowledges that he was more than seventy, and on a moderate calculation of the time he spent at Mazinduràn and Bagdad, he must have been at least eighty when he died.

There are many extraordinary circumstances connected with the life of Firdausi, of which the truth may well be doubted, and of which I forbear to give an account. Had not the publication of the *Shah nameh*† in eight folio volumes been suspended, the learned editor, Mr. Lumsden, intended in the last volume, to present a sketch of Firdausi's life, selected from the best authorities.

The *Shah nameh*, or history of the Persian kings, is universally acknowledged to be the greatest monument of eastern genius. It has survived a period of more than eight hundred years, and its author has lost nothing of the admiration due to his wonderful talents, either by the change of times and circumstances, or by the splendid train of poets who have succeeded him. Firdausi reigns unrivalled and alone in the higher regions of Poetry.

The poem is said to consist of more than sixty thousand

* Oriental Collections, vol. ii. p. 187. Also his Preface to the Tarikh Jehan Ara, p. xvii.

† Major Macan, well known for his extensive and accurate knowledge of Persian, is now engaged at Calcutta in a complete edition of the Shah nameh.

couplets,* but it is a known fact, that scarcely two copies of this great work or indeed of any Persian poem, are scrupulously alike in the exact number of couplets, owing to the carelessness, ignorance, or vanity of transcribers, who alter, omit, or add, as their fancy may suggest. A collated and accurate edition of this prince of Asiatic poets was undertaken by order of Bayisunghur Khan, one of the descendants of the great Timour in the year of the Hijra 829, that is in the year 1425 of the Christian era, corrected from various manuscripts found in the library of Bayisunghur, some of which are supposed to be nearly contemporary with Firdausi. "Could the corrected copy," says Mr. Lumsden, "be now obtained, it would very probably be found superior in point of authority to every other; but the preface being followed by a romantic account of the fate of the *Bastan namu*, before it fell into the hands of Firdausi, and by an account of the life of the poet, partly true and partly questionable, or absolutely false, has been therefore attached to almost every extant copy of the Shah Namu, and among others to that of the Noowab Buhur Jung, which was finished, according to the authority of the transcriber, in the year of the Hijree 821, that is to say, eight years before the preface attached to it had been composed."†

The rapidity with which some of the Persian writers versified, is a matter of astonishment; and the voluminous proofs still existing, evince, at least, the most unwearied diligence. Firdausi's facility in composing was wonderfully great; but

* "According to the poet's own statement, he is the author of 60,000 couplets, to which 4000 are generally believed to have been added, in order to complete the plan of the work, by Asudee e Toosee, the friend and tutor of the poet."
Lumsden.

† The publication of a complete edition in eight folio volumes, was projected a few years ago at Calcutta, by the learned Mr. Lumsden, collated from twenty-seven manuscripts, by a body of natives of acknowledged acquirements, but only the first volume was printed at the Honorable Company's press, in 1811.

the poet Roduki, his fluent predecessor, is said to have written more than a million verses!*

The *Shah nameh* is remarkable for its polish, and the musical cadence of its versification. The measure consists of eleven syllables, similar to the verse adopted by our dramatic writers, with this exception, that the lines in the Persian always rhyme together in couplets; and no language in the world is better adapted to poetry than the Persian, whether we consider its extent and sweetness, or its easy flexibility for the purposes of rhyme and versification. The language of Firdausi is nearly free from the intertexture of Arabic words, and is, in all probability, but little different from the dialect in use among the Persians about the time of Mohammed, who declared, "that Persian would be spoken in the gardens of Paradise, on account of its extreme sweetness.†

As the poem comprehends the traditional history of Irán from the remotest period,‡ the author takes advantage of so extensive a field of observation for the display of poetical invention. The wide circuit of Oriental knowledge expands subservient to the will of the poet; he looks around on the whole range of past events, and, like a powerful magician, calls up around him a creation of enchantment and fiction. The chivalrous manners of other times are masterly pictures under his hand, and the grander passions of human nature are strikingly pourtrayed. Broad touches of pathos, apt similes,

* According to an Oriental dissertation entitled Yamini, Roduki, who preceded Firdausi about fifty years, composed one million, three hundred verses!

† Sir William Jones.

‡ "The Shah Namu," says Mr. Lumsden, "embraces within the sphere of its action the whole range of Persian history, extending from the reign of Kuyoomoors, the first king whose name is recorded in traditional story, down to the reign of Prince Yezdjird, under whose government the empire of Persia was finally subverted by the successful invasion of its Moohummudan conquerors."

and strong metaphors, abound in his work. Conceptions of astonishing grandeur often start forth, and a flame of genius is almost constantly kept alive. It is, perhaps, to be regretted, that the author had not oftener made use of the mythology of Romance,* and called into action the world of supernatural beings, the poetic creation of his own country, which could not have failed to have added interest to the conduct of his poem: but such imaginary assistance was introduced only on desperate occasions.†

In an historical poem of such magnitude, comprising at least a period of three thousand seven hundred years, much poetical machinery was necessary to animate and embellish the reigns of some of the Persian Monarchs, and to break the dull arrangement of events incident to the nature of the work. But a skilful complication of circumstances, an artifice to raise mystery or uncertainty, and to excite and keep in suspense the interest of the reader, are excellences not to be found in the *Shah nameh.* Battles succeed battles, heroes follow heroes, stories relating to each other, are ingrafted on stories; and in so long a poem, the reader must be prepared to expect uninteresting details and tedious narratives; but it must be confessed, that many of the episodes are truly exquisite, and his personal descriptions, whether of heroes or of female beauty, have uncommon merit. His battle-scenes are in general, described with much spirit

* *Iran* or Persia may perhaps be considered as the birth-place of romance; from this country it emanated into Arabia and other parts. The Arabian Tales of *a thousand and one nights*, are now generally believed to be of Persian or Indian origin, and adapted to the national taste of the Arabians. Von Hammer, from a passage in Masudi, is decidedly of opinion that the Arabian Nights are of Indian or Persian origin, and were denominated *Hezar Efsan*, or "The Thousand Fables." He thinks the tales were translated from the Persian into Arabic in the reign of the Calif Al Mamun.

† See Scott Waring's Tour to Shiraz, p. 161. Many beautiful passages from the Shah nameh and other Persian works, are quoted in this very interesting tour.

and picturesque effect. As a specimen, I beg to extract the combat between Gord-afrid and Sohrab, which is exactly the Clorinda of Tasso engaging Tancred in the third canto of Gierusalemme Liberata. I am aware that the natural effect of translation must be inferior to the original, I have however attempted a tolerably close version.

Sohrab, a young warrior, the legitimate, but as yet the unacknowledged son of the celebrated Rostum, conducting the Turanian armies against Irȧn, is opposed in his progress, at the "White Fortress," by the formidable Hujir, whom the youthful hero meets in single combat, and after a hard struggle, overthrows. Gord-afrid * a warlike princess and spectatress of the combat, is plunged in the greatest distress at the discomfiture of the champion, and resolves to wreak vengeance on the youthful conqueror. After the overthrow of Hujir, the poet proceeds thus:

Fair Gord-afrid, the martial maid,
This sad discomfiture survey'd,
Saw her bold Champion captive made,
  And shed a bitter flood of woe:
Sighs from the royal maiden came,
And, though keen anguish shook her frame,
It kindled in her breast a flame
  To wreak prompt vengance on the foe.

She sobb'd, as if her heart would break;
While like a tulip blush'd her cheek:
What can she do? In beauteous haste
Her fair round limbs in mail she brac'd;
Her head a Grecian helmet † grac'd.
  Mounting her charger, onward pranc'd
The warrior maid. Pois'd in her hand
  A dazzling light her javelin glanc'd.

Floating before the Turan band,
  A falcon in her flight she came:

* *Gord-afrid* literally signifies *Warrior-born.*

† Firdausi frequently mentions the "Grecian helmet."

"Champions! if any bear that name,
Give me," she cried, "in single fight,
A war-devoted, generous knight,
Who in the lists of arms has thriven :—
Will none the blow of valour deal?
Of all who grace your lines of steel
Will none accept my challenge given?"

The youthful Hero thus defied,
Was wroth, and bit his lip of pride:
"Another deer to strike or kill—
Come on, young Warrior, have thy will."

In burnish'd helm and cuirass dress'd.
Onward his fretted steed he press'd.
In rival gallantry and grace,
The combatants met face to face.
She seem'd a knight of comely show,
And twang'd alert her golden bow,
And opened all her arrowy play
Against that crested bird of prey.
From right to left, despite his mail,
He rued the pelting iron hail;
And bitterly that brunt he took,
Still foil'd in every thrust and stroke.
At length, to burning frenzy wrought,
His buckler o'er his head he brought;
Sternly the tempest he withstood,
Though many a point had tasted blood.

With dexterous ease, her bow yet strung,
The maid across her shoulder flung,
Then urg'd her steed to full career,
And, rising, whirled a wrathful spear
On griev'd Sohrab, who stooping low
Hung sideway from the erring blow.

He, like a tiger, in that fray,
Or burst of lightning, on her rose
Dilated in his might, to close
With one dire crash the doubtful day.
He threw his ponderous spear, nor miss'd;
The keen point entering at her wrist,

And glancing upward, graz'd her breast,
Finding its way out by her crest.

Sohrab, with desperate vigour fraught,
Struck at her girdle-belt so true,
The faithless armour piece-meal flew.
He hurl'd his spear with giant force,
Which push'd her midway off her horse:
She staggers,—but the spear well caught,
Quickly a scimitar she drew,
And cut th' offensive shaft in two.

Stern to the Youth she rais'd her head,
Though not his equal—fair awhile
False Hope and Fortune seem'd to smile,
But, fickle now as ever, fled.
The Victor, with his sweeping blow,
Comes in harsh contact with his Foe,
Strikes off the helmet from its place,
And sees, surpris'd, a Woman's face!
Her look, her bloom, her braided hair
Might well a valiant heart insnare.

Sohrab, to hide his blushes, strove,
But largely, deeply, drank of love:
"Yes—Iran's * maids have wonderous charms,
Their beauty matchless as their arms!
Fly not, sweet Valour! for 'tis rare
A Deer, like you, comes to my snare.
O tell me, Princess, why you court,
Dread War,—to man e'en dangerous sport?"

Slow to the Youth thus love-assail'd,
Her eyes, her visage she unveil'd.
For what can baffled lady do,
But set her loveliness to view?
She baited well her sweet discourse,
With melting words of winning force:

* *Iran* has both syllables *long*, but it is customary to accent it on the last. This word is written *Ilan* in the inscriptions of *Kirman shah*, but the learned Silvestre de Sacy observes, that in the ancient dialect of Persia *r* and *l* are often confounded, See Recherches Asiatiques. Tom. 2, p. 70.

"Warrior! thy bravery's worth I know,
Thou parriest well a Woman's blow.
Thy soldiers deem me yet a knight,
 But if these tresses dark I show,
 Soldiers the ready gibe will throw,
And bid dishonour on thee light.
I should be loath they wrong thy skill,—
So keep my sex a secret still.
Meantime, I tender to thy care
Our fortress, and our treasures there."

When Gord-afrid her veil withdrew,
Her cheeks seem'd roses bath'd in dew;
 Warm blushing, as when morning dawns,
Shaming the peach in bloom and hue;
 While from her eyes, so like the fawn's,
 She laugh'd up love in every glance,
 And plung'd Sohrab in strangest trance!
Still to his gaze she lovelier grew—
Still opening graces dawn'd to view.

"Heed well your promise, Maid of War,
The castle's ponderous gates unbar:
And if you reck not what you hear,
Ye know the prowess of my spear.
We snap the reed on which you trust,
And raze your fortress to the dust."

 The Princess nought in answer gave,
But turning quick her charger brave,
Right to the castle won her way,
Triumphant in her Beauty's sway.*

The following description of the Persian army, marching to battle, possesses in the original much graphic effect.

The army mov'd in close array;
 The earth seem'd moving as they past;
Each banner drank the flames of day;
 Each shield a knot of sunbeams cast.

One parting squadron shap'd their way
 Across a desert, where the eye

* See Persian Extracts—Appendix, No. 8.

Descried nor shrub, nor verdure nigh;
The iron land was bald and dry.
Careering dust in clouds up flew,
Where'er the clattering horsemen rode;
The sky was indigo in hue,
As ebony the ground they trod.*

From stage to stage, in flying haste,
O'er plain, o'er hill, o'er lengthening waste,
The legions darkening as they went,
Gave life to miles of throng'd extent.
Their arms, so dazzling their display,
Dimm'd the 'mid radiance of the day.

Their polish'd tridents, sparkling spears,
Seem'd through the dust that hung between,
Dun fires behind an azure screen. †
One broad effulgence all appears!
From banners, lances, golden shields.
And light-gold sandals, you would say
Some opening cloud, blue-bosom'd, yields
Showers of bright amber o'er the way.*

The episode of Sohrab concludes with the hapless death of the noble youth, who fell by the hand of his own father. The agony of Rostum, on discovering his youthful antagonist to be his son by the sight of the well known *bracelet*, now first presented to his view; his paroxysm of anguish and remorse, in setting flames to his superb *green* pavilion and banners, which had so intensely interested his anxiously-inquiring son, when he first saw the Persian encampment from a distant eminence: and the frantic and inconsolable sorrow of Tahmínah, on learning the death of her ill-fated Sohrab, are finely described by Firdausi, and constitute, perhaps, the most beautiful part in the *Shahnameh*. The prescribed limits to which this

* See Persian Extracts—Appendix, No. 4.

† See Persian Extracts—Appendix No. 5.

* Literally thus: "From the numerous javelins, banners, golden shields, and golden slippers, thou wouldst have said that ebony-coloured clouds were showering down Sandaraca." See Appendix, No. 6.

paper must be confined, will only allow me to translate freely a part of the combat of Rostum and Sohrab.

Exhausted, baffled, each unclasps
His frustrate hold, o'erspent and slow;
Sohrab his mace that instant grasps,
And, quickly levelling, stuns his foe.
Not long he lay;—for, when he felt
Returning sense, and sight, and breath,
Panting he rose, and loos'd his belt,
Brush'd from his brow a damp like death:
Then, rais'd his troubled eye, and pray'd
For power and supernatural aid.

Again they wrestle, limb to limb,
They writhe, they deal the stunning blow;
Their eyes with gore and dust half-dim,
While down the blood and toil-drops flow.
Their heads and throats are backward cast;
The bloody struggle cannot last,—
The Youth grows faint in heart and power,
And Fortune, in that dark'ning hour,
Abandons him to worse than woe.

Look, look—to horrid frenzy wrung,
His nerves with force unnat'ral strung,
The Rostum lifts—he sways him round,
By Heaven! he brings him to the ground;
But hopes not to secure him there—
Alas! the lifted blade is bare,
A moment more, and all is done,
The FATHER, with a madman's air,
Plunges the poniard in his SON!

"Brave heart! the Youth, faint sighing, said,
"Since thou hast spilt this blood of mine,
Know, Destiny will thirst for thine,
Nor rest, 'till thy heart's blood be shed.

O could I see my Father's face,
Far dearer than my life now spilt,
'Twould soothe me e'en in death's embrace.—
But, hide thee, stranger, where thou wilt,

In gloom, where light its smile ne'er threw,
In air, or under ocean's flood,
My FATHER ROSTUM will pursue
And slake his vengeance in thy blood."

Stunn'd Rostum indistinctly heard his name—
A damp, a dreary horror seiz'd his frame;
Sight, memory, sense, forsook his wilder'd brain,
He fell as one by lightning struck, and slain!

At length, he woke as from a dream
Of harrowing torments dark and wild;
He rose, and with a stifled scream,
Gaz'd vacantly upon his child!

"O dear one! curse me not—though I have shed
Thy life-blood,—heap not curses on my head,
FOR, I AM ROSTUM!—One, ere now,
With nothing damning on my brow,
Nor hurried blindly to destroy
My brave, my beauteous, only Boy!—
What! can I think on this, and live?
No, no"—he cried, and gaz'd on Heaven.

* * * * *

* * * * *

The Father o'er his Son bewilder'd knelt,
Unlac'd the mail, undid the galling belt,
And laid his lab'ring bosom bare:
Great God! upon his arm a proof too true,
The well-known BRACELET met his startled view!—
The Father stamp'd; he tore his hair,
In all the haggardness of woe;
And yet no burning tears would flow.

Sohrab, though near life's latest throe,
Look'd all the Son forth from his eyes,
And thrice he tried, in vain, to rise;
"Nay, Father, sob not—this is worse
To bear than death-pangs, or to fall
Beneath a Parent's dreaded curse,
Or pine and pine in foreign land;
Of deaths, 'tis sure, the best of all,
To perish by a Father's hand."

At this moment, the father, in great agony of mind, sends Godurz, the Persian Nestor, to the Shah Ka-oos, requesting the medicated draught, or sovereign balsam, which had power to arrest the progress of death, but the Shah unfeelingly refuses to part with it, and the youth dies.

Distracted Father! what avail
Thy garments rent, thy frantic wail?
Why scatter dust upon thy hair?
Why gnaw thy hands, as fault lay there?
"Wretch that I am! how could I thirst
For kindred blood?—Father accurst!
When the sad tale, with many a tear,
Shall reach his doating mother's ear,
How will she loath, in horror wild,
The murderer of her glorious child!
Abandon'd to the storm of woe,
  How will she wring her hands and shriek!
And can she bear the shock! ah no!
  Dear God! a mother's heart will break."

O'er Rostum's mind no comfort beam'd;
There all was dark, there sorrow seem'd
To set a gloom so deep and drear,
Which not the smile of heaven could cheer.
  Meantime the precious corpse they laid
In silence, on the solemn bier;
  And o'er the pallid face they spread
  A regal mantle of brocade.

Slowly mov'd on the sadden'd train,
And loudly rais'd the funeral strain;
Soldiers, long worn in arms as years,
With youthful warriors mix'd their tears.
The sacred burden, sad and slow,
  Near Rostum's gorgeous tent they bore;
When lo! in one great burst of woe,
  As life and war, at once, were o'er,
  The Father, with a burning torch,
In flames set all his martial show;
  The proud pavilion, banner'd porch,
Blaz'd in a mass of spouting fire!

Mid crackling smoke, red surges roll'd
O'er his dimm'd throne, and bed of gold!
All eyes upon that flaming pyre
Are bent, and wailings fierce and high
Rose with that brilliance to the sky,
And that green canopy's display,
Nought, but a bed of ashes, lay.
Thus vanish'd all his pomp:—so all
However great, to dust must fall.

The excessive grief of the mother, and the circumstances attending the removal of the body to Sejestan (a province held with Zabulstan by Rostum, as a fief from the Shah of Irán,) are too long to be introduced in this paper.

Many poems in professed imitation of the Shah nameh have been written, as the Sam, Lohrasp, Gurshasp, Sohrab, Buhmán, and Isfundiyar namehs; most of these works, we are informed by Mr. Lumsden, are still extant, but that he was not able to procure anywhere a single copy, though the acquisition of such poems would have been of great service in detecting interpolations, and correcting the text of Firdausi.

The Persian poets are remarkable for their *minute* description of beauty, and are sure to mention fragrance as its inseparable accompaniment. The usual metaphor for a graceful form is the cypress, or sabin tree; the eye is compared to the narcissus; and a beautiful countenance to the moon. The black musky ringlets, the slow languish of a dark eye, the arched eye-brow, the regularly set teeth, are always distinctly described, from Firdausi, down to the Persian poets of the present day, as *essential* to female beauty.*

* A Persian writer has applied no less than six compounds in the following couplet in praise of his mistress, and which may be regarded as general epithets. "A moon-faced, musk-scented, heart-alluring, soul-delighting, heart-deceiving, moon-like (beauty.) See Sir W. Jones's Persian Grammar, admirably improved by the learned Professor Lee, page 80.

Khakani says, "thy eye-brow is like the *new moon*."* Firdausi, describing Manizha and Sitara, the daughters of King Afrasiab, beautifully adds: "With them are Turkish girls, all with their faces veiled, all with forms like the cypress, and locks like musk; all with cheeks full of roses, eyes full of sleep; all with lips full of wine, with the fragrance of rose-water."†

Shakespeare says:

"My Love, her mistress, is a gracious *Moon*." ‡

"She came in all her beauty, like the *Moon* from the cloud of the east." *Ossian.*

It may be here observed, that a young fawn, or gazelle, conveys an image of peculiar tenderness to the mind of an Asiatic, and is a term often applied to a beautiful woman.

Firdausi, like *Homer*, gives much colour, strength and conciseness to his similes. *Homer*, for example, represents a chief in war, ωστε λεοντα, like a lion, λυκοι ως, like wolves. So *Firdausi* describes a hero rushing to battle "like a raging lion,"§ "like a wolf," or "mad elephant," "like a crocodile," or "like a moving mountain."

Many a periphrasis, in the true spirit of Poetry, may be found among Arabic as well as Persian poets. A few of the more general expressions may be mentioned. Hafez calls *wine*, "the flaming ruby,"‖ "the liquid ruby," which is nearly

* See Persian Extracts—Appendix, No. 8.

† See Persian Extracts—Appendix, No. 9.

‡ Love's Labour Lost, Act 4, S. 3. See also Coriolanus, Act 5, S. 3. For more on this subject, see Atkinson's elegant notes to his free version of Sohrab.

§ See Persian Extracts—Appendix, No. 10.

‖ See Persian Extracts—Appendix, No. 11.

the language of Milton, who calls *wine* "the dancing ruby sparkling out-pour'd." Mohammed, however, stigmatises *wine* as "the mother of sinners."* Sir William Jones, in his beautiful Latin Commentaries on Asiatic Poetry, remarks that *Abu'lola*, an Arabian poet, designates *doves* as "the daughters of sadness;"† *echo* is called "the daughter of the mountain;"‡ and *wine*, "the daughter of the grape;"§ and he shews that the Greek poets use the same figure of speech, for Pindar calls *wine*, αμπελον παιδα, "the son of the *vine*;" and *showers*, παιδας νεφελης, "the children of the cloud;" and *day*, he terms παιδ' ἁλιου, "the child of the sun." Chæremon‖ in Iŏ calls *flowers* εαρος τεκνα, "the children of spring:" and it may be added that Horace calls a *ship*, fabricated from a pine-tree, sylvæ filia nobilis, "the daughter of a noble wood."

Among many allusions to which Asiatic poets are attached, the poetic love of the "Rose and Nightingale" is most frequent. The Persian bulbul is said to resemble our nightingale in the compass and excessive sweetness of its notes. It sings by night, and its melody is by no means suspended during the day.¶ Jami says, "You may place a hundred handfuls of fragrant herbs and flowers before the nightingale,

* See Persian Extracts—Appendix, No. 12.

† See Persian Extracts—Appendix, No. 13. Ah! these daughters of sadness render me sleepless.

‡ See Persian Extracts—Appendix, No. 14. In the Syriac *echo* is styled the "daughter of voice." The Italians call the nightingale "voce pennata," "the feathered voice."

§ See Persian Extracts—Appendix, No. 15.

‖ Vide *Athen.* lib. xiii.

¶ See Sir William Ouseley's Persian Miscellanies, page 140.

yet he wishes not, in his constant heart, for more than the sweet breath of his beloved rose."*

Excessive and overstrained metaphors, and an unnatural inflation of language, are faults ascribed to Asiatic poets in general. In many instances, particularly among inferior authors, the accusation may be admitted as just; but we also know that a similar censure may be passed on many European writers of no elevated genius. In the Eastern climate, it must be confessed, that this growth of false taste seems to be more prevalent; but a warm imagination, under the influence of a burning sun and a luxurious system of life, will not readily submit to the rules of a cold and severe judgment; besides, which, Asiatic works on the principles of Poetry and Rhetoric are of an unphilosophic description, and possess no power to regulate public taste. The Oriental poets seem to have been left entirely to the ebullitions of their glowing imaginations.

We may question, too, whether the accusation of extravagance and bombast may not rather attach to Eastern writers of prose rather than of verse: for this vice of style seems to have originated in the slavish adulation and hyperbolical language usually offered up, in petitions, at the throne of Asiatic monarchs, whose vanity will not be satisfied unless overwhelmed with a torrent of high sounding epithets. It is, therefore, to be feared, that many Europeans, judging only from the inflated language of the court, have passed an indiscriminate sentence upon all Asiatic writers; though, it must be confessed, that many excellent authors, from a mistaken notion of clothing their thoughts in dignified language, have too often degenerated into inflation and bombast.

Firdausi seldom indulges in a turgid and extravagant style; but a simple and beautiful diction pervades the whole poem.

* See Persian Extracts—Appendix, No. 16.

In so long a work many inequalities will necessarily be found; and Firdausi may be charged with occasional puerilities of thought, and meanness of expression; but he is seldom guilty of the *Ibarati Rengheen*,* or flowery style, in which subsequent poets have more or less indulged.

Sadi,† who is, perhaps, the next poet to Firdausi in excellence, makes use of the flowery style in some part of his dedications and poetical prefaces; but many of his *babs* or

* Not only poets, but writers of prose too often indulge themselves in this vicious style. We may quote from several authors, but one specimen from the *Akhlak Muhsiny* of Hussein Vaiz Kashifi will suffice. "The falcon of the wisdom of each perfect man takes its flight in the atmosphere of the praise of Alexander, for this reason, that the phœnix of his ambition did not stoop her head to the bone of the fragments of this world. Verses: Thou, the falcon of the royal wrists, look not upon bones; give a lofty flight to the phœnix of thy ambition." This is a literal translation.

Notwithstanding the numerous instances of the *Ibarati Rengheen* in his writings, Kashifi is an author of great merit. His Anwari Soheily, or Persian paraphrase of the Kalila Dumna, or Pilpay's Fables, in fourteen chapters, is an elegant work. It was finished in the end of the 15th century, when he resided at the court of Sultan Hussein Abul Ghazy Behadur, sovereign of Khorasan.

Several *concetti* from Marino, and other minor poets of Italy and Spain, are nearly of the same colouring; from our own poetry of the time of Elizabeth we may gather many of these wild conceits, and not a few in Shakespeare. The romantic wish of Juliet that her Romeo "*might be cut out into little stars* after his death, and made to *adorn the face of the heavens*" is of this sort: also when our immortal poet, describing the blood on the body of the murdered Duncan, says—

"Here lay Duncan, his *silver* skin *lac'd* with his *golden* blood."

In another place he exclaims, in the true spirit of an Asiatic—

"Her bed is India—there she lies a *pearl*."

† Musle-Huddeen Shaikh Sadi is called by Jami "the nightingale of the groves of Shiraz." See Persian Extracts—Appendix, No. 17.

chapters in the *Gulistan*,* and his poem entitled *Bostan*, are models of elegant writing, and generally free from this blemish.

The *Gulistan*, or Rose-Garden is the most celebrated production of Sadi; it exhibits sentiments of liberty and independence, which seem ill-suited to the slavish adulation which surrounds an eastern court. The whole work is an intermixture of prose and verse of nearly equal proportions. The style of the prose is of a novel description, when compared with the prose in use among Europeans; for it is highly polished, and part of it poetical, a kind of composition known among the Orientals by the name of *Meruj-jaz* having measure without rhyme. Sadi is fond of antithesis, so that one part of his sentence is often a balance to the other: and his prose is occasionally sprinkled with rhyme, which is a species of composition called *Mesuj-jah*, having rhyme without measure. The work consists of eight *babs* or chapters containing tales or apologues on the conduct of kings; on the morals of durweshes; on the excellence of content; on the advantages of taciturnity; on love and youth; on imbecility and old age; on the effects of education; and rules for conduct in life.

The fifth chapter on love and youth is the most exceptionable in a moral point of view, and the language is intentionally ambiguous, and sown thicker with Arabic sentences than either of the other chapters.

The *Bostan* is a long and regular poem in rhymed couplets,

* The Gulistan was finished A. D. 1258. Gentius has published a Latin translation of it, under the name of *Rosarium Politicum*. Mr. Gladwin translated the Gulistan into English, and Mr. Ross has lately published another English version of the work, and promises the public a translation of the Bostan, which is a great desideratum. A new edition of the original Persian has lately been published at Calcutta, with a compendious commentary, and dictionary of the more difficult words, by Moolvy Jumnuzuddy.

of the same measure as the *Shah nameh*, the works of Nizámi, and other voluminous authors. The imagery and sentiments are of a very high order, and the language is, in general, beautifully simple. Among other productions of Sadi, we may enumerate the *Molamaat*, or the Rays of Light, a collection of miscellaneous poems; six Rasallahs, or tracts in prose; a *Diwan*, or collection of *Gazels* or odes; Arabian and Persian *Casidahs* or elegies; a variety of mystical *Gazels*, dirges, and other poems. The *Khubisaat*, or prose and poetry on impure and ludicrous subjects, is also attributed to him, a composition decorated with all the graces of seductive poetry. If Sadi be really the author of this work, (of which there is little doubt,) it is lamentable to think, that one capable of producing poetry of so much beauty and morality, should at another time, so far prostitute his talents, as to add the most tempting fascinations to licentiousness and sensuality. It is said, however, that he afterwards endeavoured, in an Arabic introduction to that work, to palliate it by observing, that he thought it would communicate a relish to his moral productions, as "salt is used in the seasoning of food."

Sadi was one of the Shaikhs, or superiors of the religious order of Durweshes, a kind of Mohammedan monks; and spent all his life in travelling into foreign countries. He lived to a very advanced age, upwards it is said of a hundred years,* and was buried at Shiraz, his native city, which Baron Revicski calls the "*Athens of Persia.*"

Mohammed Shemseddin, surnamed Hafiz,† is the most popular poet of Irân. He was born at Shiraz, and enjoyed

* Dowlat Shah and Ibrahim Khan affirm that Sadi lived a hundred and two years; but Jami reports him to have been older. Ali-ben-Ahmad enumerates twenty-two books as the entire works of Sadi. See the English version of the Gulistan, by James Ross, Esq.

† *Hafiz* signifies *accurate observation and perfection.*

the munificent patronage of Timour, improperly called Tamerlane. In his youth he was addicted to convivial pleasures and dissipation; but toward the decline of life he devoted himself entirely to religious duties and penance: and, notwithstanding the liberality of his patrons, he died in necessitous circumstances, and was buried at Mosella, near Shiraz.

The works of Hafiz chiefly consist of *Gazels*, differing only from the *Casidah*, elegy or rather idyl, as to length; for the *Gazel* seldom exceeds seventeen couplets, and sometimes only seven or eight; and the *Shah-bayit*,* or last stanza, generally includes the *Tokhullus*, or poetic name of the writer. This species of ode is a little gem as to polish, delicacy, and beauty; lively images and picturesque expressions impart elegant life to it. Hafiz is unrivalled in this kind of graceful poem; he resembles Anacreon, or rather Horace in some of his lighter pieces, and the tender spirit of Petrarch breathes in others. He is said to have written at least six hundred *gazels*,† but manuscripts vary as to the number of these little poems. His images are drawn fresh from nature, and in most instances are aptly applied. In his most elevated ode, he is carried away by a bold and abrupt spirit almost amounting to sublimity; but the subject of love and conviviality is more congenial to his feelings.‡ Whether the allusions to the *sakey* or cup-bearer,

* *Shah-bayit*, or king-couplet.

† See Appendix to Hindley's Hafiz. About a hundred of these gazels have been translated by Revicski, Jones, Ouseley, Hindley, Nott, and Wahl.

‡ As a specimen of Hafiz, the following *literal* version of one of his gazels may afford an imperfect idea: I translate from the Lithographic edition, published at Calcutta, 1826.

Sweet is the area of the garden bestowing pleasure, and the society of friends. May the season of roses be propitious, for that is the time agreeable to wine drinkers.

Our soul is sweetened by each fragrant breath of the morning breeze: yes, yes—and the perfume of the souls of lovers is sweet.

The unopened rose-veil has shown its intention of departure; make thy so frequent in Hafiz and other Sufi poets, are to be referred to the ardour of devotional mysticism and allegory, or to be understood in a plain sense, is doubtful. † Many of his odes partake largely of the religion of the Sufies, which "appears to be a compound of the philosophy of Plato and Berkeley. They conceive that the light or spirit of God illuminates all things, and which, being reflected on us, is the cause of our perceptions. Persuaded of this truth, they behold all things with sympathy, as sharing in common with themselves in the bounties of the Essential One."*

The *Masnavi* † is a favourite species of verse, in couplets, consisting of eleven syllables, with a strong accent on the last syllable of each foot.‡ Long poems are written in this measure. The *Masnavi* is generally employed on subjects of love, or on descriptions of a cheerful and delightful kind, as the

lamentation, O nightingale! for sounds from the heart of wounded *lovers* are sweet.

May the night-warbling bird bring joyful tidings, since in the road of love its nightly complainings are sweet to sleepless lovers.

Although in the bazar of the world there is nothing of heart-happiness, except its name, the blandishments of the *ruby* draught, and the cheerfulness of the temperate are sweet.

From the tongue of the lily this voice came to my ear, that, in this dull, worn-out *age*, the occupation of the light-burdened is sweet.

O Hafiz! to bid adieu to the ways of the world is dear to the heart, so do not suppose that the circumstances of the worldly-minded are pleasant.

† See more on this subject in Hindley's Hafiz, p. 8,

* Scott Waring's Tour to Shiraz, p. 220. Beautiful versions of some of the odes of Hafiz, Mohtushim, Ruqueeb, and Jami, are to be found in this very interesting tour.

† Or according to the Arabic pronunciation *Mathnavi*.

‡ Sir William Jones exemplifies the measure in the following Latin distich—

Jane pater, Jane tuens, omnium
Principium, fons, et origo Deum.

charms and pleasures of spring: or, in a word, on any subject, whatever be its length, of an agreeable or pathetic nature, and capable of being embellished with the graces of poetry.

Nizámi is an author of great excellence in this species of poem. He is remarkable for his strength of conception, richness of imagery, and for diction, in general fresh and beautiful;* but the frequent terseness and compression of thought in his couplets render him often obscure and mysterious. Some of his poems are avowedly allegorical, and deeply imbued with a spirit of Sufeism. Nizámi is also valuable for much curious and historical matter scattered through his works, particularly in his *Sekander nameh*, or history of Alexander the Great, which is decidedly one of the most beautiful productions of the east; many of the exploits described in the poem coincide with, and many differ from, the received accounts of the Grecian and Roman Histories. The author has often confounded the romantic adventures of the ancient monarch of the east, *Iskander dhu'l Kareen*, or having two horns, implying his conquests from east to west, and who is mentioned in the Korán, Surât 18, with the achievements of *Iskander Errumi*, or Alexander the Macedonian. His other works are held in high estimation, among which we may mention his fascinating romance of *Khosru and Shireen*, founded on the story of Khosru the son of Hormuz, surnamed *Parviz* or Victorious, who reigned in Persia at the time of Mohammed, and his romantic fondness for his beautiful mistress Shireen. Indeed, all Nizámi's writings abound in fine Oriental imagery, pleasing allegories, and much useful learning. Sir William Jones has translated, in prose, twenty tales and fables from *Makhzeni Esrar*, or Treasure of Secrets, and is of opinion that an English version of all the works of this author is a great desideratum. Among his other

* Sir William Ouseley quotes this distich of Hafiz in praise of Nizami—"The poetry of Nizami, in the whole circle of ancient writers, has no equal for grace and elegance of language."—Persian Miscellanies, p. 77. See Persian Extracts—Appendix.

celebrated poems are the *Heft Peiqur* or Seven Forms, containing the romance of *Baharam* or *Burham Gour* who lost his life in hunting;* the *Esrari-al-Ashikin* or Secrets of Lovers; and the story of *Leila and Mejnun.*

As a specimen of Nizámi's style of composition, I beg to extract a few lines which precede the fine description of the hostile armies, and the fall of Darius, translated by Sir William Ouseley from the *Sekander nameh.*

"The graceful motion of the cerulean sphere,
With its orbits, the stars, and moon, and sun,
Think not that they have been made for idle sport,
Or that this fair curtain (the canopy of heaven) has been formed in vain.
In this glorious web no thread is without its use,
Though the *end* (or object) of it may be concealed from us.
Who knows what is to happen to-morrow?
Or that which shall yet remain in obscurity:
Can we tell the man whose affairs Fortune shall direct?
Or him with whose life Destiny shall sport?
Can we point out him who to-morrow shall be brought forth a lifeless corpse from his habitation?
Or him on whose brow Prosperity shall place a diadem?
Who knows, on this clay which we now trample under foot,
What blood of heroes may have been shed?"

The *Mathnavi* or *Masnavi* by Jelal-uddin, surnamed Rûmi,† is a work of great genius, and contains passages of exquisite beauty and pathos: but, in his ardour, the poet abandons himself to the most extravagant and abrupt allusions, by which he frequently becomes unintelligible to his readers. Sir William Jones, in his Essay on the Mystical Poetry of the Persians and Hindus, has given a very beautiful version, in couplets, of the Introduction to the *Masnavi*: and in the

* Hunting the *Gor*, from the earliest period, was a favorite pastime among the Princes of Persia.

† Surnamed *Rumi*, because he settled in the lower Asia. The Orientals gave the name *Rum* to Turkey, Greece and the whole Roman Empire.

catalogue of Oriental manuscripts, he thus speaks of the poem; "so extraordinary a book as the *Masnavi* was never, perhaps, composed by man. It abounds in beauties and blemishes, equally great: with great obscenity, and pure ethics; with exquisite strains of poetry, with flat puerilities; with wit and pleasantry, mixed with dull jests; with ridicule on all established religions, and a vein of sublime piety: it is like a wild country in a fine climate overspread with rich flowers, and the ordure of beasts. I know of no writer, to whom the Maulavi* can justly be compared, except Chaucer and Shakespeare."

Jami's works are said to consist of forty different compositions in prose and verse, in Persian and Arabic:‡ but his best production is undoubtedly his fine poem of *Yusouf o Zeleekha*, founded on the history of Joseph and Zeleekha his Egyptian mistress, whom the Arabians also call Rail. Jami has drawn his materials from the chapter of Joseph in the Koràn, and extended his poem to about four thousand couplets. The late Professor White of Oxford, in an appendix to the Institutes of Timour, has affixed an admirable version of the sublime opening of this poem.

Among other authors of esteem among the Persians, we must not omit Hatifi, the nephew of Jami, celebrated for his poem on the loves of *Leila and Mejnun*, a subject on which Nizámi, Jami, and others have written. Abdoulah Hatifi is also the author of the loves of *Khosru and Shireen;* the *Heft Manzar* containing the loves of Buhrâm Gour; and the *Timur nameh*, or the history of Timur. He died in the year

* He is also called *Maulavi Rum.* He flourished in the thirteenth century. Sir William Ouseley informs us that his poem consists of above thirty thousand couplets, but manuscripts vary as to the number of verses.

‡ See Preface to the Jehan Ara.

1521 of the Christian era. We may also mention the spirited odes of Anvári, the Kulliats of Cátebi and Ahli; but to enumerate all the poets of Iràn is to count the stars, for every accomplished man cultivated the poetic art; and the empire of Persia, even to this day, is the genial land of poetry and eloquence.

APPENDIX OF ORIGINAL PASSAGES.

No. 1.

لقد هتفت في جنح ليلٍ حمامة   علي فنن و هنا وانّي لنا يمُ
كذبتُ و بيت اللّه لو كنت عاشقاً   لما سبقتني بالبكاءِ الحمايمُ

No. 2.

قال ابو عطاء السندي و اسمهُ مر زوق اسلامّي

ذكرتك و الخطيّ يخطر بيننا   و قد نهلت منا المثقفة السمرُ
فو اللّه ما أدري و انّي لصادقٌ   أداءٌ عراني من حبابك أم سحرُ
فان كان سحراً فاعذريني علي الهوي   وان كان داءً غيرهُ فلك العذرُ

No. 3.

چو اگاه شد دُختر گژد هم   که سالار آن انجمن گشت گم
غمين گشت و برزد خروشي بد رد   برآورد از دل يکي باد سرد
زني بود برسان گرد و سوار   هميشه بجنگ اندرون نامدار
کجا نام او بود گرد آفريد   که چون او بجنگ اندرون کس نديد
چنان ننگش آمد ز کار هجير   که شد لاله بر کش بکردار خبر
بپو شيد درع سواران بجنگ   نبود اندران کار جاي درنگ
نهان کرد گيسو بزير زره   بزد بر سر ترک رومي گره
فرود آمد ازدژ بکردار شير   کمر بر ميان باد پاي به زير

زدش، فت پو یان بکردار باز   یکي تیزه در دستش آهن گداز
به پیش سپاه اندر آمد چو گرد   چو رعد خرو شان یکي ویله کرد
که گردان کدامند و سالار کیست   زرزم آوران جنگ رایار کیست
که بر من یکي آزمون رابجنگ   بگردد بسان دلاور نهنگ
بجنگ ارپش اشکر سرفراز   مر اورا نیامد کسي پیش باز
چو سهراب شیر اوزن اورا بد ید   بخند ید ولب را بد ندان گزید
چنین گفت کامد دگر نارة گور   بدام خداوند شمشیر و زور
بپوشید خفتان و بر سر نهاد   یکي ترك *چیني بکردار باد :
بیامد دمان پیش گرد آفرید   چو دخت کمند افگن اورا بد ید
کمان را بزة کرد و بکشاد بر   نه بد مرغ را پیش تیرش گذر
بسهراب برتیر باران گرفت   چپ و راست جنگ سواران گرفت
نگه کرد سهراب و آمدش ننگ   بر آشفت و تیز اندر آمد بجنگ
سپر بر سر آورد و بنهاد روي   ز پیکار خون اندر آمد بجوي
هم آورد راد ید گرد آفر ید ::   که برسان آتش همي برد مید
کمان را بزة بر ببازو فگند   سمندش بر آمد برابر بلند
سر تیزة را سوي سهراب کرد   عنان و سنان را پراز تاب کرد
بر آشفت سهراب و شد چون پلنگ   چو بد خواة او چارة جو شد بجنگ
عنان برگراید و برداشت اسپ   بیامد بکردار آذرگشسپ
چو آشفته شد شیر تندي نمود   سر نیزة را سوي او کرد زود
بدست اندرون نیزۂ جان ستان   پس پشت خود کردش انگه سنان
بزد بر کمر بند گرد آ فر ید ::   زرة بر تنش یک بیک بردر بد
ززین برگرفتش بکردار گوي   که چوگان زباد اندرا ید بروي
چو برزین به پیچید گردآفر ید   یکي تیغ تیز از میان بر کشید
بزد نیزۂ او بدو نیم کرد :   نشست از برزین و بر خواست کرد

This extract is enough to show the beautiful simplicity of the original.

* Some MSS. read رومي

No. 4.

هوا نيلگون شد زمين آبنوس

No. 5.

چو آتش پس پردهٔ لاجورد

No. 6.

زبس گونه گونه سنان درفش   سپرهاي زرين و زرّينه كفش
تو گفتي كه ابري برنگ آبنوس   بيامد بباريد از و سندروس

No. 7.

ماهٔ روي مُشكبوي دلكشي   جان فزائي دلفريبي مهوشي

No. 8.

بروي تو چو ماهٔ نو

No. 9.

همه دُخت تركان پوشيدهٔ روي   همه سرو قدّ و همه مُشكموي
همه رُخ پر از گل چشم پرز خواب   همه لب پر از مي ببوي گلاب

No. 10.

چو شير ژيان   چو آشفته شير   چوگرگ   چو پيل دژم   چو پيل ژيان
چو پيل مست   چو نهنگ   چو كوهي روان &c.

No. 11.

لعل آتشين   لعل مذاب

No. 12.

امّ الخبائث

No. 13.

الا نبهتني فتيات بث

No. 14.

بنت الشفة

No. 15.

بنت العنب

No. 16.

نهه صد دسته ريحان پيش بلبل   نخواهد خاطرش جز نقهت گل

No. 17.

سعدي آن بلبل شراز چمن

No. 18.

ز نظم نظامي كه چرخ كهن   ندارد چو او هيچ زيبا سخن

VIII.

AN ACCOUNT OF THE COLLECTION OF DRAWINGS OF MAJOR HAMILTON SMITH, F. R. S. F. L. S. &c. &c. &c. AND MEMBER OF THE PLYMOUTH INSTITUTION, IN A LETTER TO THE PRESIDENT.

Sir,

THE collection of Drawings in my possession which you pronounced extraordinary, and which the Society, judging from specimens sometimes produced in the illustration of lectures, has done me the honour to notice with some approbation, may, I trust, be deserving of an abstract notice in explanation of its contents. I am induced to consider such a step requisite, because many specimens of the different series which it embraces, have been published at home and abroad, and even in America, by the Antiquarian Society, by my learned friend Dr. S. R. Meyrick, by Mr. Griffith, Dr. Leach, the late Mr. Howitt, Mr. Colnaghi, myself, and by unknown persons, sometimes with, and at others without, my name or knowledge. From the occasional appearance of such fragments, some have been led to suppose, an assemblage of ancient costumes, and others, of zoological figures, alone were in contemplation; while even those who had seen a great part of the collection, thought it to consist, merely of sketches and drawings of middling execution, without necessary connection or subordination to a digested plan. It is therefore with some desire to rectify misconceptions, that I now address you, trusting the curious will judge them from the same point of view in which they were made, and from being acquainted in some measure with the history of this undertaking, the difficulties that were surmounted, the multitude of channels that were explored, be prepared to take them in the same light that guided me in their formation.

Encouraged by your approbation, and stimulated by the expressed desire of many members of the society, and even by several individuals, both at home and abroad, remarkable for rank and knowledge, I enter upon the subject, requesting that what must unavoidably appear personal in its course, may not be considered as arising from a wish to obtrude private concerns upon the notice of others; but that a statement of the question in all its bearings could not be made without such reference; and also that by these explanations, young men similarly situated, and possessing similar facilities, might be induced (by this example of mere industry) to pursue something of a like plan; with the certainty, at a future time, of reaping an equal or a superior harvest.

With reference to the intention of the collection, the spirit I mean which directed the acquisition of its materials, I must observe—that although it was by no means intended to undervalue the advantages of skill in designing, and beauty in the execution, of the drawings; yet the fundamental principle adhered to, being directed to the acquirement of knowledge, of all such facts and objects as could be presented to the mind, by a direct exhibition of pictorial forms, that object did not necessarily embrace a style of execution such as I had not skill to produce. But taking them as types, which by means of lines and colours convey to the eye at one glance a more definite idea of a given object than language, however precise, can effect, I felt that with perseverance and industry, a very considerable mass of information might be collected in one focus, upon a more comprehensive plan than is to be met with in any collection of the kind, which has yet come to my knowledge. From an adherence to this plan resulted the very extensive amount of the collection; for, although the whole without almost a single exception, is the work of one hand, the number of objects delineated, amounts to about ten thousand. I must however, confess, that the greater number of drawings are only so far advanced as to contain the requisite characteristic minutiæ; few are entirely finished; and some still remain in pencil: let me add also my regret that several of the most finished have disappeared.

Although these explanations seem to account for the number of materials collected, and for the unfinished state which attaches to many, they do not point out the causes of facility in drawing outline with satisfactory precision, nor of applying a system of colours with propriety and dispatch. It is true that the steps taken to attain these powers in a passable degree were not all in consequence of a premeditated plan, but that many fortuitous incidents in life seem to have co-operated to constitute a kind of destiny to that effect. It may be irrelevant in this place to refer to private matters of detail, but I trust that what I am going to state will escape censure, because there may be interest in some parts and instruction in others; and it will appear that no work even comparatively trifling, is to be executed without preparation, trouble, and perseverance.

By a kind of instinctive desire to form collections of figures, before I was fifteen years old I had already contrived to sketch, during the hours of interval between scholastic studies, upwards of three hundred animals, taken from the works of

Buffon, Pennant, Edwards, and others; but it was not till after the first years of the war, (which occurred soon after,) had passed over; during a voyage down the coast of Africa, and subsequent residence in the West Indies that a second collection, wholly drawn from nature was made. This, however, being mostly destroyed by accident, discouragement ensued, and I resolved for a time to confine my pursuits to memorandum sketches, while a course of drawings of the human figure, sometimes with, but oftener without, the aid of masters, prepared the way to resume my plan with greater effect. For this purpose, a very extensive series of engraved statues and bas-reliefs taken from the antique were copied; at first, by tracing the whole figure, soon after by tracing only the chief points, and finally by drawing wholly by the eye. Having run through all that I could find of the ancients, and secured a competent knowledge of their style, I turned the facility thereby acquired to the human model, and studied assiduously in that climate so peculiarly favourable to display the freshness and elegant contour of youth, and the muscular vigour of physical man; unfettered by the habitual restraint of close garments, which makes the model of Northern Europe comparatively unsatisfactory, and unlike the sculptures of antiquity.

A system of shading and colouring proceeded with the drawings, but when I had resumed my plan, it was found necessary to establish a method of colouring such objects as from circumstances could not be tinted on the spot. The privations incident to a traveller who has penetrated into the wilds of America, had soon induced me to put in practice a system of indications, which if it did not completely supersede the actual use of colours at the moment, at least, produced an approximation which would differ only in the intensity of any particular hue, and therefore would not be much more remote from the precise colours of the individual object, than what will be found to occur between two specimens of the same kind, not identically the same. All artists know, that the colours of nature are mostly relative, and appear positive only inasmuch as they stand in opposition to others—that is, they are positive by contrast. Hence, a proper application of half tones, distributed according to the laws of light and shade, will bring a proper outline to resemble its prototype so very nearly, that with the addition of some slight local colours, the resemblance will become sufficiently exact to satisfy a critical eye, even when in juxta-position, with the object from which it is copied. This effect, in general, is produced on paper by the use of neutral greys; but if these greys, especially those intended for more delicate objects and distant shadowings, be composed from the admixture of the three elementary prismatic colours, the effect is not only more certain, but often magical. For as the three chief prismatic colours, though separate, will produce light, or a white tone when set in motion, so when they are blended with the brush, they appear as in a state of repose, and produce the most delicate and most natural effect of shade. The aerial tints resulting from the combination of the elementary colours of the prism, pass most readily into transition tones, such as form the basis of the most brilliant positive hues. By the simple increase of the quantity of any one of the three, we obtain the most transparent purple greys, blue greys, or yellow greys; which, in a state of greater intensity, laid on with blended edges, offer faithful imitations of metallic reflected colours, such as occur in polished steel, or cupreous transitions; and when applied in a weaker state, readily admit any local colour that may be wanted to produce the positive tone required.

Being familiarised, by dint of practice, with the relative proportion of each colour required in a mixture to prodnce a given tone, it was no difficult matter to reduce it to a system which might represent their various combinations, with so much certainty, as to admit only a minimum of difference.—Any person intending to effect such a purpose, would readily find an equal or a superior method—that which first presented itself, was, in some measure, analogous to an Algebraical formula. Thus, in all cases of plain colouring where the Heraldic mode of indication by means of the particular direction of lines, was applicable, that was adopted, with or without the combining + (plus) indicating also a decreasing ratio of the added colours, in the gradation of their order. In this manner, for example, ≡ + ||| + ⊙ * would represent two parts indigo, one lake, with the addition of some gamboge, being the elements of one of the aerial greys. If the tones required, were not amenable to this simple formula, others were adopted—as for instance: Ind. Ven. red 1. or indigo, Venetian red, No. 1. that is the two colours where blue predominates: with the fig. 2, the red would increase in strength, with 3 it would be still stronger, and with the figure 4 become almost pure. These mixtures of two colours, as also lamp black and Indian red, blue and burnt terra di sienna, are all vehicles, which combine with or suffer the super-imposition of a local colour, and can be regulated with absolute certainty to the tint required. In this manner, practice rendered the method of noting easy and sufficiently certain when applied, to make the tone differ from its type only by a trivial shade. This method was also used to colour by candle light, and it seldom occurred that a sketch put in colour by the above process, was afterwards found to vary from the original more than above stated, although both were placed together for comparison.

But, although by perseverance and labour, a competent knowledge of drawing in all its branches had been attained, and memorandum sketches occasionally added together, were at length bound up in five folio volumes; nevertheless, professional studies; duties on the Staff and in the Engineer

* I am aware this formula might have been expressed with more accuracy, but it was for my own use, and right or wrong it stood for better. Here it shews that ≡ the Heraldic designation of blue, standing first in the order of arrangement, is also the predominant colour by one half; the next ||| red, less; and ⊙ gamboge or yellow, least.

department; repeated voyages across the Atlantic; travels in both Americas, and several campaigns, absorbed so much time and diverted so much my attention, that it was not until a short period before I was called to an official situation at the Horse Guards, (about 1810) that my purpose, which until then had been vague, began to assume that consistent form which admitted of inserting in the different series of drawings already begun, every successive addition without deranging the plan. Matured by reflection, and in possession of much unarranged matter to act upon, the system adopted comprehended chiefly the following points: First, to make typical designs in the spirit before alluded to, from all authentic materials that circumstances would allow me to collect, in zoology, antiquities, costume, paleography, heraldry, and topography, upon paper of uniform size, (4to. atlas,) classing them in a systematic manner; to attend in particular to the colour of objects according to nature, the original document, or history; and to furnish each subject with an explanatory notice, containing the authority, together with historical, biographical, or scientific remarks.

For this last purpose, a kind of common place book, or rather a number of books, alphabetically marked, were appropriated to the accumulation of notes, headed by some leading word, and containing chiefly discussions relative to the filiation of nations, paleography, philology, and antiquities, collected from a multitude of sources, and forming essays, summary abstracts, or simple definitions. Although these amount at present to above one thousand, I must own scanty use has as yet been made of them in illustration of the drawings; and, excepting in the lectures read before the Society, where some extracts have been occasionally introduced, I fear, that for want of assistance I shall not be able to complete this part of my original intention, or communicate in another way several facts and observations, little known or altogether new to the British publick.

Before I proceed to a more detailed notice of each series, I must beg leave to dwell a moment longer on some general considerations, applicable to the mode of adopting the materials to the system I had in view. It is unnecessary to enter into a discussion concerning the dependence of language upon images to convey just ideas. The relations between them have been shewn; but I am not aware that it has been pursued with equal attention in the more confined sphere of the fine arts—to the association between pictorial figures and our imagination. Such, for example, as occur upon reading poetry, romance, history, voyages, travels, or such other subjects, as relate to persons and physical objects; when, if we pay the least attention to the text, we immediately find our mental perception engaged in forming it into moving pictures, where men and things are clothed in the colours of nature, and pass before us like a scenic exhibition. Upon further examination we discover that this perception is vivid, and pleasing in proportion as sensible objects of a kindred class, (and therefore adapted to individualise our imaginary picture,) have been previously impressed on the memory: that, on the contrary, if we are destitute of these elements to clothe the fancy, or if we possess such as are improperly applied, the imagination cools, we become indifferent, or feel a painful want; an indication that we do not rightly comprehend the subject. Although the eye reading alternately books and pictures, may become in a degree accustomed to erroneous types, constantly afforded by the arts, particularly about the æra of their renewal, when Jason might appear in Gothic armour, and St. Paul be converted in the middle of Turkish cavalry with pistols in their holsters; still where criticism is sufficiently advanced, we feel considerable abatement of the admiration which the skill of the artist so often calls forth in every other department of his production. Other things may be so fast established, by use, as to escape censure; such as evangelists with modern folios before them, or doctors in the Temple with spectacles on their noses; but with regard to the national histories of modern Europe, where we are, or at least where we ought to be, more critically correct, artists have not inquired into the proprieties of costume with half the judgment evinced by the ancients on the bas-reliefs of the Trajan and Antonine columns. It is scarcely half a century since Roman armour has been introduced with the least correctness, and only a quarter of a century that a Greek can be distinguished from a Roman; but in the costume and armour of our own nations, Mr. West could still represent the Conqueror and Edward III. habited like Charles I.—and on the stage, Richard III. even now flourishes his sword, with a hat and mantle, which, if ever they belonged to any period of costume, must be referred to the time of James I. On the Continent, the matter is worse; the Germans sheathe in plated steel, paladins of Charlemagne's court; and in France, the antiquaries themselves confound the armour of five different centuries.* It must therefore be a service to endeavour to spread a more correct acquaintance with the subject, nor is the idea of its desirableness confined to myself.

"It is not," said Mr. West, on looking over my earliest collections of costume; "It is not that artists do not feel the "impropriety of many things they introduce in their composi-"tions, but that they must trust to what they can find as models "handed down by their predecessors; because it would require "a different education, and a whole life of research to collect "their materials, whereas they live scarcely long enough to be "thoroughly instructed in all the other branches of their pro-"fession. It is therefore much to be wished that some one "would furnish the art with an ample store of such documents

* See Recherches sur les Costumes, &c. par Malliott and Martin, vol. iii, fin du xi. siecle. Renaud de St. Gilles and others armed, &c. as if in 1480. These are from a series of Earls of Toulouse, in a MS. of the fifteenth century, at the earliest. I have copied the whole, but not as genuine. See also the statues of the church of St. Sernin at Toulouse, said to be of benefactors and cotemporary with Earl William and Countess: they are of the sixteenth century. This is really wanting criticism.

"as the historical painter in particular is constantly wanting; "for although the French have done much to improve Mr. "Gavin Hamilton's plan, regarding the Roman costume, and "we begin to have a critical knowledge of what ought to be "considered as exclusively Greek, from the work of Mr. Hope; "still every thing is to be done for our national history, and "therefore I rejoice to see a beginning made in this collection, "where I approve of your view of restoring monumental effi- "gies to the attitudes and colours of life; because while they "remain as given in the works of antiquaries, mutilated, "colourless and generalized, they are useless to us; it is right "also to improve the drawing of subjects taken from Anglo- "Saxon or other ancient illuminations, because young artists "will never willingly consult ill-drawn figures, which, because "they offend the eye, they are apt to consider as of no value "to the science of painting."

These remarks of the late venerable president of the Royal Academy, which are given, as nearly as possible, in his own words, are of themselves sufficient authority for the view then already taken of the question; and there remains only one more objection to be answered, in order to remove the last argument which has sometimes been used against the application of a correct costume; it is averred that the proposed costume may not be picturesque, that it may be altogether ridiculous, and therefore apt to take away the intended effect of a serious composition. To this objection, therefore, it may be answered that a thorough knowledge of the art and of the materials with which to clothe a composition does not imply, that judgment and taste are to be laid aside; but that both should be used so as to modify, conceal, or actually omit what would offend a sound critical judgment. Finally, where the true costume of a given æra is introduced with taste and judgment, it will unquestionably lend an air of reality and vigour to the composition, which no fancy dresses or misdated materials can ever bestow.

As I have been led to make a more particular allusion to costume, it may be proper to begin with the different sets of the series connected with this question, commencing with those of the most ancient nations of which pictorial documents remain. These are the more curious, because the conjectural hints of De Sacy and Ackerbladt, led the late Dr. Young to a discovery which Monsieur Champoleon has extended to satisfactory readings of the long unintelligible hieroglyphical inscriptions of Egyptian antiquity—what therefore was until lately vague conjecture, is now daily becoming historical; and the Egyptian collection of costume, now under consideration, will shortly be as completely within the reach of explanation as any other document, where the figures are accompanied by inscriptions; at present, with some exceptions, they depend upon conjecture, All the materials of the set are taken from the insculptured monuments of Egypt; and many of these are still on the walls and ceilings of temples and catacombs, in the full splendour of their original colouring. The set consists at present of fifty drawings, containing above one hundred and fifty figures of gods, kings, heroes, priests, warriors, women, artisans, musicians; of foreigners, such as Syrians, Greeks, Arabs, Jews, Negroes; chariots, boats, temples, porticoes, funerals, processions, &c. They were obtained chiefly from the original sketches of one of the artists employed by the institute of Cairo; others are from the monument and work of the late Belzoni; from the paintings within the coffins of mummies, and from the Papyri found upon them; from the great work of the institute published at Paris; from Denon and other sources.

From this set we learn that the bull Apis or Mnevis had not invariably the same colours and markings; that the priests on ceremonial occasions wore masks, representing the heads of their many typical divinities. We see all their idols carried in arks, with veils often covering the Theba; we find the brazen chariots, such as Herodotus relates to have issued from the hundred gates of Memphis. Here artists will see that Osymandias, Memnon, Sesostris and the Pharaohs, appeared in a very different costume from the Romanised Greek dress, in which they are usually figured. We can distinguish the blue-eyed Phœnician, the cheretim or bowmen, the prisoners and the women; we observe, that the complexion of the men varied from reddish to dark brown, between the Delta and the cataracts, but that the women were uniformly of a pale colour; here are sowers and reapers, hunters, dancers; punishments, wrestlings, rejoicings, &c. Among the most curious, is an attack upon a fortress, unquestionably the most ancient battle-picture in existence;—the Egyptians are storming the walls by means of a testudo, unnoticed by the ancients; it seems to be of rhinoceros or camel's hide, supported by men, upon which the assailants are mounted, while others are scaling the walls upon ladders. There is also a naval battle between Egypt and the Syro-Phœnicians, of which however I have copied only the most prominent ships. A prince of the Memphian dynasty, receiving homage, with his enemies painted bound upon his footstool, and lying on the ground, as noticed in the Psalms of David. To these, I have still to add Egyptian horse races from Herculaneum, and domestic scenes from the Prœnestine Mosaics.

In the second set are assembled the costumes of nations not less ancient than the Egyptian—those of Persia, or Iran, together with some specimens of Babylon and Ancient India. Of the latter only two are from bas-reliefs, taken out of the ruins of the desolate City—they show figures drawn with a feeling almost Greek, and dresses composed of cloths made by the union of many plaits, which no doubt were of various colours,* and had the effect of stripes. As this mode of

* The garment of many colours is noticed, when Joseph was sold by his brethren. The Arabian figures among the Egyptian paintings wear clothes of many stripes.

making cloths remained in practice to a late period among the Celtic nations, it may well have existed in Babylon before the mechanism of weaving was understood. At least, such appears to be the character of the draperies as expressed by the artists, whose style of drawing proves there was more skill than in some of the posterior bas-reliefs on the surface of rocks in Persia, where, however, the draperies have no such characters.

Of Indian specimens there are likewise but few; they were mostly copied by the late Mr. Devis, from the alto relievo colossal idols of Salsette, Elephantina, Elora, and Pohogulpoor. It may be worth observing that, with due allowance for caricature, the costumes of idols almost invariably represent the ancient dresses of the nations to whom they belong, particularly when they have a form determined by usage: thus the most ancient Hindoo divinities exhibit the national costume, perhaps anterior to the era of the Gymnosophists, noticed in the expedition of Alexander the great. The colossal Budho in particular wears the garb of his priesthood, and his being always painted with a red skin, it proves that he was a Northern Caucasian, and not a Mongole. This also occurs in China, where the same sect represent him and his subordinate personifications not only as a white man, but one with a red beard: the dresses of these gods are of Chinese, and not of Mantchoo fashion.

The costumes of ancient Persia are taken from the bas-reliefs of Persepolis or Chihel Minar, from Taki Boustan, from the cavern of Shahpoor, &c. according to the copies of them, furnished by a multitude of travellers, and in particular by Morier and Ker Porter; and from casts now in the British and other museums. I have also obtained some sketches of the Achœmenian princes, at Nakshi Rustam, and of the Sassanian and Arsacidian dynasties, from the same place, and from Nakshi Rajab. These last, although they are overlooked by Firdausi, were the chiefs of the mighty Parthian's confederate empire, the Malek el Tuaif, kings of tribes; history proclaims their triumphs—and their numerous monuments evince the advanced state of the fine arts in Persia at that time.

Of the Achœmenian dynasty, we see a king, perhaps Darius Codomannus, but more probably Hystaspes, (Kyshtasp) buried in an immense wig and beard, asserted to have been of borrowed hair: we see this prince on his throne surrounded by his household, before him the golden horns charged with jewels, which when reached, gave the right of sanctuary; beneath his feet the stool which was too low for Alexander; above him the Solar eagle, and the canopy adorned with a row of horses, (Phul) one of the types of the sun. In the drawing I have grouped the figures, and given the whole a perspective *ensemble;* which in the original is partly plan, partly elevation, disposed in rows, as is always the case in pictures designed during the infancy of art: belonging to this dynasty also, are the procession of the Satrapies, personified by figures bearing the tribute in kind, for which each was particularly distinguished.* Each group is attended by a herald or guard, some of which appear in the simple garb of Persians, while others are magnificently dressed, and may be Medes: others, still more splendidly accoutred, with quivers and bows on the shoulders, and artificially curled beards and hair, may represent the immortals. There are also Eunuchs, known by their muffled mouth, and menials distinguished by the same attributes of office which mark their present representatives in India. Smerdis Magus, or Lohrasp? occurs also, but less positively; and Khosru Parvis in a magnificent costume from the original bas-relief at Taki Boustan, so carefully detailed as to give the minutiæ of embroidery. The colossal idol of Ormusd? (who as well as the original Rustum, was a personification of the sun,) from Shahpoor, shows the costume of the heroic age of Persia; and his shaggy tunic may represent the impenetrable Burburcan of the Iranian Hercules. A figure on horseback of Rustum, or of Khosroe Parvis, is also seen at Taki Boustan—the face and body are covered with ring mail;

* The 27th of Ezekiel may be consulted for the explanation of this monument.

the horse's head, neck, and breast, with small plates of metal, adorned with tassels; on the near side of the saddle, hangs the Camaund or ancient Lazzo; and on the off side, the Yak tail to drive off insects—this is altogether a most complete specimen of the cataphracted horse of Persia. It was from these kind of armed warriors that the posterior crusaders derived their word of Saracen *(Serro-d-gin)* a mailed rider.* Beside these, there are monumental obelisks, with Pelhevi inscriptions, tombs, ensigns, &c. Of later periods, there are costumes from the illuminated Shah Nameh of Göttingen, Saracens and others, which may belong to the eras of Alparslan or Chenghiz, when the institutions of the Khalifate had totally changed the ancient manners and habits of the country.

With regard to authorities for colouring the subjects of Indian and Persian costume, unlike the Egyptian, which are, or were invariably painted, there is more difficulty; but in order to save artists the trouble of searching, attention has been bestowed upon the scattered notices in the ancient classics, relating to this question. Several of the originals, and probably all, were painted; some still retain traces of their pristine colours; from these, with the help of the immutable usages of the East, retraced in their illuminated books, and even in the painted toys of Benarez, (which still deserve some notice,) an attempt has been made to complete that object.

After the Persian may be ranked a small series of Greek figures, chiefly of those anterior to the era of Pericles; they consist of that curious discovery at Egina, groups of statues, once painted in encaustic, and representing the heroes of the myrmidons, the Æacidæ and Trojan warriors in conflict over the fallen Patroclus. Several also from fictile vases, represent warriors and virgins: but it is my intention to extend this series to the Greek types of the fabulous beings which they painted

* Others will derive it from the Arabic *saree*, a desert.

or produced upon the stage—the furies, menades, gorgons, satyrs, fauns, centaurs, amazons, arimaspians, genii, &c. from the fictile vases, which occasionally represent scenes of dramatic pieces, of which no other notice can now be found in the ancients; there are also from similar sources, mostly brought from Bengazi, by Mr. Le Marre, sundry costumes and figures which illustrate Greek Cyrenaica and Roman Carthage. They may be compared with those lately published by Capt. Beechy, and it may also be worth observing that artists, if their composition will improve by the practice, may embellish Greek and Roman architectural decorations with colours, for it is not in Africa alone, but also in Greece, Ionia, and Italy, that the practice is proved to have existed, wherever time and climate have not obliterated the evidence.

To the Greek may be added a few Etruscan and Volscian costumes of soldiers, shepherds, horse races, &c. taken from bronzes, painted tiles, and bas-reliefs.

In the fourth set are collected Roman and Byzantine costumes, in 89 drawings, making 158 figures. I am indebted to my friend S. R. Meyrick, LL. D. for his manuscript and collection on this head, which supplied me with the first part, to which are since added many interesting specimens; among which, a figure of an officer of the Ala Noricorum Claudiana, on horseback, and a *signifer* of the 14th Gemina Martia Victrix, the celebrated Western legion of that number; both from monumental bas-reliefs at Bonn. A Roman lady putting on the strophium, from the Portici bronze; with this figure are placed Egyptian bathing women, and the scene is in a bath, with all the furniture, taken from different antiques. Next is a curious exhibition of equestrian and tumbling performers, taken from an ivory diptic, which shews that a Roman booth was not unlike those of the same nature at an English fair. There are also horsemen, legionaries, slingers, and other bar-

barian soldiers of the lower empire; probably some are Goths of the time of Ricimer, Stilicho or Ætius—they are taken from the reliquiary of Sens, and from Christian sarcophagi at Toulouse, &c. But the most curious perhaps of all is the fine costume of a Varangus, or one of that guard of Scandinavians and Saxons which were so conspicuous at Constantinople. The figure is from the paintings in the cathedral of Ravenna, and is of the time of Justinian; his armour is the same as that remarked on Northmen of a posterior date;—a hialm, or scull cap, halsberg, baldur, or ring kragh, covered with golden studs or bezants, and a Saxon tunic, sufficiently distinguish this body from other Byzantine warriors. On his shield he bears the sacred ☧ which distinguished the prætorian bands from the legionaries, from the time of Constantine.

It is curious that the Scottish author of the romance of Alisaunder, should make his hero wander through a *terra incognita* in Asia; where, among other monsters, he meets with the Varangi—

> "A folk woneth biside thoos,
> "That beeth y-clepid Farangos,
> "That haunteth wildernesse and forestes,
> "And nymeth thereinne wilde bestes,
> "And fleshe hy eten raw and hoot,
> "Withouten Kycchen, god it woot."

Little suspecting that among these savages the name of Drummond was not unknown, as appears by the Icelandic Viga Styrs;—sub anno 1011. In the same drawing, behind the figure, is a *signifer*, with the Labarum; such as was preserved at Brescia till the late revolution.

The fifth and sixth sets form a very long series, relating chiefly to Britain. In the first are collected a great number of Celtic monuments, and antiquities, found scattered over a considerable portion of the old continent, from the coast of Malabar, and the province of Coimbatoor to Scandinavia, and

Iceland. Cromlehs, crom-cruachs, kistvaens, peulvans in Asia Minor, on the coast of Africa, in the islands of the Mediterranean; in Italy, Spain, Portugal, France, the Netherlands, Germany, Denmark, Great Britain and Ireland. Costumes from Celto Roman bas-reliefs; representations of tribal and family penates; pillar house gods; *ondvegis sular and setsiokkar;* next, all the authentic figures relating to the Gothic, (chiefly the western) race that I have met with on the continent: and the costumes &c. of the Anglo-Saxons to Edward the Confessor, with whom the history of the Gothic race, and the Saxons as a people, ended. This series, consisting of about 170 drawings, containing an immense variety of objects, was brought together in aid of written documents, that have been accumulating for several years, with a view to the illustration of the origin of the nations of Western Europe, and the primitive filiation of the Caucasian tribes. Fragments of these researches have appeared in several lectures read before the Society.

It was also in connection with these enquiries that a series of paleographic alphabets and inscriptions was collected; to facilitate the investigations of the ramifications and descent of the dialects of Europe, and compare the affinity of the Semitic with Sanskrit, and the Hindu and Hindu-Mongolic tongues.

In the Celtic series, there are a considerable number of objects never before published, and not a few drawn upon the spot, either in this country, when in the company of members of this Society, or discovered during personal researches abroad. Some of these have been published already by the Antiquarian Society, and also at New York; and others may be expected shortly to appear in illustration of the antiquities of Dartmoor, in the 'Transactions' of this Society, by one of the members. With respect to the Anglo-Saxon costume, it is copied in general from illuminated manuscripts in the British Museum. The sketches consist of princes, nobles, ladies, soldiers, archers, shipping and buildings. Most of the Codices are versions of the scriptures; and it is a singular illustration of the affinity between sensible objects and our minds, to find that all the figures of Israelites, patriarchs, princes, and warriors, are designed with the most scrupulous fidelity to the *Saxon* costume. Abraham contends against the five kings clad in a ringed Saxon tunican. The departure of Israel out of Egypt shews a Gothic town, with a row of bare-headed horsemen holding lances, with banners of different colours, like Polish hulans. Judah gives Tamar his staff and armlet, (not a ring) &c. In making this collection, I had ample opportunity of verifying the fidelity, industry, and judgment of the late Mr. Strutt; whose works would have been my sole guide for tracing out the original documents, had I not received voluntary assistance and advice, from my learned friend, Mr. Petrie, keeper of the records.

For the Scandinavian costume, and Anglo-Danish figures, I am indebted to friends at Copenhagen, and to the British museum. In this also, scriptural subjects are depicted with Northmen forms. The massacre of the Innocents is perpetrated by warriors in the rustred tunics, and hose, and nasal helmets, used by the Danes: there are, in this sub-division, some interesting delineations; such as Knut and Aelfgiva, from that king's own prayer-book. Of Pagan Northmen—there are heroes, with the sun and star upon their shields: their helmets adorned with eagle plumes, as noticed in the Temora of Ossian; sword dancers and horsemen from the golden horns, formerly of the Copenhagen museum, but now destroyed. In the collection are figures of both transmitted from that city.

It was from the Celtic and Scandinavian sets, as they stood at that time, that Dr. Meyrick and myself, published the costumes of the Aboriginal inhabitants of the British islands; but many and important additions have been since made. Of that publication, in justice to my learned friend, it must be said, that the materials concerning the Britons, are almost entirely from his own stores.

And now I come to the sixth series, according to the arrangement, but the earliest in point of date. Here are collected by far the greater part of the sovereigns, nobles, knights, and ladies, of Great Britain, whose effigies still remain sufficiently perfect to serve for types, whether it be in the shape of recumbent monumental figures, brasses, bas-reliefs, stained glass, or illuminated miniatures:—to them are added prelates, monks, artisans, hunters, cross-bowmen, archers, bill-men, shipping, architectural parts, furniture;—in short, all the appurtenances of the feudal ages, disposed in chronological arrangement. This, the oldest collection, was begun about the year 1809, while on the recruiting service at Coventry, and carried forward by the advice of Messrs. Howlett, Nixon, and in particular of that zealous antiquary T. Sharp, esq.—From excerpta of the first materials, Mr. Colnaghi, undertook to publish sixty plates of the ancient costume of England; a work which was terminated in November, 1813. Upon the appearance of the first numbers, the late president of the Royal Academy, Mr. West, expressed his pleasure and approbation; the late Mr. Devis then painting his celebrated picture of the Barons; and the late Mr. John Kemble, immediately joined in its support. Their opinion no doubt had considerable influence; for it is from that period that artists and dramatists began to distinguish the differences, to be marked in the successive ages of the feudal era.

In this collection, as it now stands, exclusive of materials in hand, there are above three hundred knights* in armour, taken from their monumental effigies, and restored in those parts that might have been wanting, from comparisons with a mul-

* It is remarkable that of British military monumental figures, above a third are cross-legged, though several of known crusaders are not so.

titude of similar and contemporary objects. Chiefly from this part of the collection, and from the notes belonging to it, Dr. Meyrick drew the illustrations, and part of the descriptions of his superb work on ancient armour; and I have understood that while in his possession, Sir Walter Scott did not disdain to take some memoranda from the figures.

As the Anglo-Saxon series terminates with the Confessor, and the battle of Hastings, the feudal set opens with the Conqueror, and extends at least partially to Charles II: with the exception of the kings, whose effigies are carried down to George the Third. These drawings amount at present to 694 specimens, English, Scots and Irish. Some families whose monuments have been best preserved, appear in succeeding generations—the Beauchamps, the Veres, Staffords, de Clares, Nevilles, Berkeleys, &c. Many also whose names are unknown but whose era may be fixed with considerable certainty, from the costume alone, are here produced: for it may be observed, that the criterion offered solely in the form of the armour would be decisive, if it were not that the civil contests so frequent in the history of England, impoverished and often attainted individuals and families, from which their monuments are sometimes of a date several generations posterior to their deaths. Others having ordered their own effigies to be sculptured, have survived the completion of the work for such a length of years, as to appear in the costume of their ancestor:—finally, that confusion exists in almost all the churches where early monuments now occur, caused by the loss of epitaphs, the occasional removal of some, the transfer of others, from religious establishments, secularised at the reformation, and from the want of critical knowledge to judge of the age of the objects, in the resident clergy, and the authors who have written upon ecclesiastical antiquities, and topographical histories.*

* I have no doubt that several knightly effigies in Exeter cathedral are ascribed to the wrong persons.

There are many figures of general interest, and others which would strike but partially. Richard the First, Berengaria, Sir Stephen le Fleming, a crusader; Edward the Third, Queen Philippa, the Black Prince, the Maid of Kent, John of Gaunt, Sir John Chandos, Sir Walter de Mauny, Sir Thomas Erpingham, &c. Some have been copied from their monuments in France, others from stained glass in the Netherlands; and there are not a few from the original designs, said to be by Hollar, which were in the collection of Abbe Mann, in the last mentioned country.

Such as were copied from glass, or illuminations, required no investigation to colour them; but although many if not most, sepulchral effigies, were painted, and upon diligent investigation, still show traces of the colours; many, and in particular, those from brasses, required the exercise of discretion: fortunately, armours, with few exceptions, consisted of steel without gilding; and the surcoats of arms invariably heraldic, were readily ascertained; so that no serious mistakes could well occur in what remained, if reference were made to contemporary illuminations.

To the ancient or feudal costume of the British Islands, belongs a collection of notes, historical, biographical, and critical, with a view to illustrate this part of the collections more fully and minutely than others, but in transcription and arrangement, no great progress is yet made.

After the British follows the Continental series of the Chivalrous ages; the German, which may be numbered the seventh, though not as yet abundant in specimens, is not without some of considerable interest, because they throw a light upon the British periods: and the monumental effigies are more numerous in the tenth and eleventh centuries, when scarcely any can be noticed in these kingdoms. Moreover as they are very commonly placed upright against the walls of churches, they are more perfect, and very often retain all their original colouring. Among the most curious are Charlemagne from the mosaic of St. John Lateran at Rome; the figures of Roland and Oliver, from the very ancient statues in the portal of the cathedral at Verona; Conrad I. Emperor of Germany, from his monument in the fine Byzantine church of Limburgh on the Lahn which he built in 912, and where he was buried in 919 or 920; Gerold I. Marquis of Lusacia, taken from Grosser's *merkwurdigkeiten*; he died in 956. Then follow some unknown great vassals of the empire, from their cast silver and enamelled statues on the shrine of Charlemagne at Aix la Chapelle, and the founders of the cathedral of Nauemburgh, from their statues of the same time, which appear to have been early in the eleventh century. Walter de Glizberg of 1036, from Erfurth, (the first with regular heraldic bearings.) An earl and countess of Arnim, the last pagan and pirate family in Western Germany, who were forced to take sanctuary in Minden cathedral in 1157: Otto count Bodenlauben, and countess, 1231, at Frauenrode: a series of landgraves of Thuringia and Hesse, from Marburgh: the emperor Louis IV. of Bavaria, and the electors living 1310—1319, among whom is the remarkable John, the valiant duke of Luxemburg, and king of Bohemia, then a young man, but the same who fell half a century after at Crecy. True to the spirit of the times, the three ecclesiastical electors are in full armour, only to be distinguished from the others by their blazon, and the mitres which constitute the crests of their helmets. This set is taken from the originals of stone in alto relievo, now in the museum of Mayence, and till lately adorning the commercial hall of the city, built in 1319. But the materials for augmenting this particular series are so abundant, that want of time alone has prevented its being much more extended than about 70 drawings. I cannot however forbear to mention the Knight of the Valley of Death, by Albert Durer, introduced here on account of the costume, and because it is believed to be the portrait of the celebrated Franz von Sickingen, the last chivalrous character of that class in Germany, and the first who drew the sword in favour of the Reformation. He sacrificed his life in that cause; and when the event was reported to Luther, he exclaimed that "the Lord would not have the sword to defend his cause." *

In the eighth series are those of France and the Netherlands, together with a few Spanish, Italian, and Morisco subjects. They amount to about 120 figures, several of which are connected with English history. A copy of the homage of the duke of Bourbon to king Charles V. of France, exhibits the grandees clad in mantles of their blazon. The constable Du Guesclin bears the white wand. Charles VII. and the Maid of Orleans, from a drawing of the bronze figures, twice destroyed, but originally placed on the bridge at Orleans. Francis I. and Henry III. both on horseback, from beautiful illuminations on vellum; said to be by Primatiche.

Among the Belgians is a knight of the ninth century, in tegulated armour, representing St. Gerion, from a bas-relief at Xanthen; several dukes of Brabant and Cleves, earls of Flanders and Holland; a curious *brevet d'amour*, where the knight's war horse is caparisoned in blue, charged with a roundelay, and the musical notes formed of golden fleur de lys; this was in the archives of the cathedral of Tournay. Sir Francis van Halen, knight of the garter, formerly in the church of St. Rumbalt at Mechlin. Among the Spanish are the Christian and Moorish knights, and Moorish chiefs and ladies, from the paintings in the Alhambra of Grenada. In this series no use has yet been made of "Montfaucon's Antiquités Francaises," nor of "Millin's Continuation," because the materials in my possession, which escaped the notice of both, and survived the iconoclasm of revolutionary fanaticism, are not exhausted.

* Some anecdotes of him, preserved by Professor Justi in *die vorzeit*, shew that he was a real military reformer.

Although this is not the place to discuss the history of armour, before I conclude the notices of the costumes of feudal ages, it may not be irrelevant to observe that from a comparison of nearly one thousand figures of knights and warriors, no instance of a well authenticated contemporary effigy occurs, where plate armour is pourtrayed before the second quarter of the fourteenth century, with the exception of greaves, or shin plates, which are found as early as 1250. Plate armour followed the introduction of roundels and aillettes, (small plates) fixed on the elbows and shoulders, and genouilleres or knee-pieces, which replaced the round padded cushions of mail of Edward the First, that is about 1307. Before the year 1325, half brassards, and half pauldrons occur; they were semi-cylindrical steel plates buckled on the arms; and also, cuisses on the outer thighs. The stained glass figures of benefactors in Tewkesbury Abbey; Sir Robert de Buers, at Wesley Waterless: and so late as 1347, Sir Hugh Hastings, and the surrounding knights, on the brass at Elsing, C. Norfolk, are examples of this; but the last already displays the arm-plates complete and hinged, similar to the armour of the monumental effigy of Charles duke of Alençon, who was killed at Crecy, in the preceding year (1346); and which is the most ancient of the kind among the French. Plate armour in Germany, is somewhat older; and in Italy, I believe it was introduced still earlier, for these nations were more advanced in arts and manufactures than their western contemporaries, whose energies were solely bent on mutual unprofitable destruction.

In the ninth series are assembled, designs of costumes which demanded particular research and attention; and although it is far from complete, contains already many interesting specimens. To those conversant with the works which treat of the military and religious orders of knighthood, it is a well known fact, that with few exceptions, and exclusive of badges, crosses, and collars, the plates are absolutely fanciful. Many figures of knights are pourtrayed in armour and costumes which never existed at all, or represent fashions posterior to the extinction of the orders they pretend to illustrate. With a view to obtain designs founded upon such authority as could claim an admissible degree of authenticity; recourse was had to original statute books of orders; stained glass and monumental effigies, and pictures representing personages in their knightly costumes, chapteral, conventual or military. Chance also supplied me with a series of miniatures, preserved from an illuminated codex, treating on the subject, and formerly in the library of one of the resident tongues * at Valetta. Those which I had the good fortune to find still together, were mostly of the early religious orders, repeatedly figured according to their classes, duties, ceremonies, and successive changes. The sources of information must have been authentic, for not one offered the anomaly of armour not properly belonging to the period represented. The knights of St. John, of Jerusalem, were figured in costumes unquestionably correct, as early as the end of the thirteenth century; the Templars, Teutonic knights; Lazarionites, Sepulchrians, and knights of *St. Thomas of Canterbury*, unnoticed in English history, (and, as far as I know, quoted only by the writer, cited by Kasper Henneberger, an eye-witness, who states them to have been 5000 men at the last siege and destruction of Ptolomais or Acre, 1291,) likewise occurred. What appeared remarkable was, that the "Courte histoire et figures des ordres &c. 12mo. published at Amsterdam, 1699," contains figures evidently taken from this source; but that from some cause the most ancient and interesting have been left unnoticed. If a competent inquirer would search among the early pictures of family portraits in the old castles of Italy, much interesting information on the present subject would still be found. Confined as my own researches have been, by means of friends, and by constant attention even on

* It may be superfluous to remind the reader, that the order of St. John of Jerusalem or of Malta was classed by tongues or languages, not by nations.

the orders of knighthood, much matter has been collected.—Sketches have been obtained from Spain, Portugal, France, Italy, and Germany. There exist now, or at least until within these few years, pictures of crossed knights, and religious orders in the church of the Manger, at Nazareth. They were discovered, I am informed, in the south aisle, on repairing those of some saints of the Greek church painted over them; there are also similar remains in fresco, on the walls of the castle of Arwad, the ancient Aradus, and at Rama *—there are crusaders, or more properly templars, painted on the walls of the hall of ——— castle in the Pyrenees, once the refectory of the resident knights. At the castle of Lacerda, in Castile, there was, until the French invasion, a gallery of ancient knights of the several orders of Spain. Hollar has preserved the twenty-six founders of the Garter, set up by Bruges, garter king-at-arms, in the reign of Henry the Fifth, in stained glass, at Stamford; and the creation of the order De la Banda was represented in a picture, which may still exist in Queen Johanna's palace, near Naples. From the above, and from several monumental effigies, the series (as far as it goes) is composed; and to complete the history of chivalrous institutions, the ceremonies are added which relate to the vigil of arms, the creation of a knight, the joust, tournament, and combat on foot—all from original illuminations or satisfactory authorities. Among others, the supporters of coats of arms figuring, not on seals, but in person, at a joust and combat given by the Spaniards, at Brussels, in 1568.

Finally—that nothing important might be wanting in the *ensemble* of the feudal ages, there is a considerable series of great seals of sovereigns, great vassals, and knights, of different countries and ages; and a collection of armorial bearings, from the rolls of the camp at Halidon hill, Caerlaverock, the barons of England, the nobility of Scotland from Sir David

* In the ruins of a convent are still to be seen the arms of several German nobles; and similar traces in the conventual church on Mount Sinai.

Lindsay; the great nobility of Germany, many of France, the Netherlands, Spain, Italy, Hungary, and Poland. All these are in blazon, and many with quarterings, supporters and crests. Where the feudal ages terminate, commence the military costumes, from the time that regular stipendiaries wearing general badges, and posteriorly uniforms and regimentals were adopted. They consist of figures of different nations, and come down chronologically to our own period. Amongst the most curious is the earliest hand-gun used by cuirassiers in the innocuous armies of the Italian condottieri, abont 1471. English hand-guns, and bow-men of nearly the same period follow, both marked with the red cross upon their breasts and backs, There are the Swiss of the field of Moret, and those who formed in four ranks at Fornoue, dressed in party colours white and yellow wambaize, and red and green hose. Venetian turcopoliers or light-horse, afterwards known as cravats, and since by the Hungarian name of hussars. Russian horse of 1530, croats of 1494, and hussars of 1595—In this collection are found different kinds of cannon, bombards, and machines of war, used since the invention of gunpowder; soldiers, guards, light horse, archers on horseback, men at arms; banners and standards of Henry the Eighth; Welshmen half-clothed, and bearing javelins, as they appeared at the siege of Boulogne; officers, ensigns, and soldiers of the regiments of Temple and Sidney, and cuirassiers of that of Essex, all serving by command of Elizabeth, in the wars of the Low countries; wild Irish, in the service of Spain; and White Moors, and Highlanders, fighting naked at the battle of Rymenant near Mechlin, in 1579.* Then follow the horse of Charles the First, and the Parliament infantry, when red clothes first came into use; cavalry and infantry, under Marlborough; Highlanders, when first raised into a royal regiment, the costume of the army under the duke of Cumberland; Prussians of the seven years' war; till we reach the contests of our own times.

* This was probably the last display of the custom of their ancestors the Macatæ, Picts, and Caledonians.

The military costumes relating to the wars which arose out of the French revolution, form the next series; here we find the uniforms of regiments and chiefs, often named in the vicissitudes of that sanguinary period. French, Russian, Austrian, Prussian, Bavarian, Swedish, Danish, Dutch, Spanish, Portuguese, Wirtemberg, Baden, Swiss, and Italians, mostly drawn in the field. The British series was etched by myself, and consequently were not worked up in finished drawings. A part was published in 1813—1814, and in conjunction with the foreign corps in the British service, and several statistical tables, forms the concluding series of military costume. These last were all taken from the patterns at the Board of Clothing, and from orderlies at the Horse Guards.

I have yet another series of costumes to mention, one of very considerable extent, but of less interest, because it is in a great measure derived from modern publications. In this collection are arranged the more recent modern dresses and habits of the world. Those of Europe contain many from the original drawings in the collection of the late duke of Cumberland, in the King's library, now transferred to the British museum; the Turks from originals transmitted from Constantinople; the Persian, Indian, and Chinese from paintings by native artists; the Negro and American aboriginal tribes are many of them sketched from life; and the ancient Mexican costumes are taken from their own picture writings in the library of Berlin, &c.

The modern costumes stand in some relation with the topographical collection I am about to notice; but before entering upon the series of views, it will be proper to mention a separate collection, still unnoticed, and perhaps the most interesting of the whole. It is that which contains delineations of the different kinds of ships and vessels used by man from the earliest period, and brought together for the purpose chiefly of illustrating three papers on ship building, and the ancient arts of navigation, read successively before the Society. Commencing with the single log of the Coranas, the double and triple log catamarans of Australia, ancient Peru, and the present Madras, it presents to the eye successive improvements on the (Baris) bundle of rushes, the raft, balsa, canoe, the primitive river-craft of the Tigris, Indus, and of the Nile; then sea vessels of Egypt and Phœnicia, Greek and Roman triremes, lintres, holcos, the galleys of the middle ages, galeasses, galeons, hurcas, palandries, balingers, caraccas, caravellias, ships of forecastle; and finally men of war of different dates, classes, and nations; forming 138 figures in 102 drawings.

The topographical collection, which, according to the arrangement pursued follows the shipping, constitutes the second grand division of the work. It consists of views in different parts of the world; of which about 600 were drawn upon the spot, during repeated voyages and travels through Europe and America: to these were added a considerable number copied from the original sketches made by friends, or collected by them, and in general by military associates in both hemispheres. Among others, Col. Trench, Major Pierrepont, Lieut.-Cols. Bainbrigge and Freeth, Capt. Appelius, the Rev. W. Hennah, &c.—to which must be added, several most interesting scenes from the beautiful sketch books of Mrs. Buckland. From Capt. Delafons and other officers of the Royal Navy, Chinese scenes and views in the Indian Ocean, and on the coast of the Mediterranean have been obtained, as also several Polar scenes. In order to render this collection still more complete, copies were taken from the views published in a great number of modern voyages and travels. Europe forms about four-sevenths of the whole, exhibiting scenes in Great Britain, Ireland, the Channel islands, France, the Netherlands, Germany, Sweden, Norway, Denmark, Russia, Greece, Italy, Sicily, Switzerland, Spain, Portugal. Then follow Barbary, Western and Central Africa, the Cape, the East coast, Abyssinia, and Egypt. In Asia, Anatolia, Syria, Palestine, Arabia, Persia, India, China, Australia, and Polynesia. In America, the Polar regions, Canadas, United States, California, Mexico, the West Indies, Terra Firma, Guiana, Brazil, and Peru; the whole amounting to about one thousand nine hundred drawings.

I come now to the third and last great division of what has been termed my interminable collection; that from which many specimens have been published in Europe and even in America, and the one for which I have ever had the strongest predilection. Here are collected the result of observations and sketches of many years, carried on through vicissitudes of climate and circumstances, in the camp, at sea, in garrison, in forests, and in museums of both hemispheres. Thirty-four great establishments for the study of natural history have been consulted; and among these, the Leverian and British museums, Bullock's, the Missionaries, the India Company's, the Jardin du Roi, at Paris, the Museums of Munich, Dresden, and Berlin; those of Bonn, and of my learned friend Mr. Temminick; also of Philadelphia, New York and Baltimore, have afforded the most plentiful supply of materials. In this last, minor private collections are not included; though in justice to the liberality of Mr. Leadbeater, and Mr. Drew of Devonport, I must not omit the many valuable and sometimes unique objects I have been enabled to copy from their stores, as also from the most varied menagerie in Europe; I mean that of Mr. Cross, late of Exeter Change, from whence I have derived many sketches, taken from living specimens. After these sources, I must mention extracts of the collections of original drawings at Paris, Berlin, the British museum; those of Baron Cuvier, and of his brother the Chevalier F. Cuvier. The grand collection of the late Sir Joseph Banks, Gen. Hardwicke, Mr. Le Sueur, John Wilson, esq. Miss Gosseling, Dr. Leach, and John Gray, esq.

In the Mammalia, the physical history of man is illustrated by a great variety of designs of human crania; portraits of many individuals, and whole lengths of the races, some of which are taken from living specimens. The Carnivora are very abundant; particularly the families of viverrine, ursine, canine and feline animals; but the ruminantia are particularly numerous, and form by far the largest original collection in existence. Since the paper on this order was published, in Mr. Griffith's translation of Cuvier's *Regne animal*, many important additions have been made to a collection, chiefly through the liberality of General Hardwicke; and it is a pleasing duty to add, that more are promised by the active exertions of the Asiatic society, and from Canton and Brazil—these series contain above one thousand figures.

Of ornithological specimens, the museum of the Jardin du Roi at Paris, furnished alone near six hundred. Bullock's, the Philadelphia and New York museums have likewise furnished a great many. In this collection, are the greatest number of objects from private cabinets, and from original drawings, executed in India. It is particularly rich in Palmipedes, Lamellirostres, Gallinaceæ, and Grallæ. Some passerine families are likewise numerous, and contain several not as yet engraved, notwithstanding that so many works on ornithology daily issue from the press—Mr. Howitt and Mr. Griffith have published several.

The birds figured amount to about two thousand three hundred, all accompanied by an appropriate backscape, to illustrate the habitat of the species. I ought to have stated in the Mammalia that similar backscapes have been sketched to them, often taken on the spot where the specimen was found or where it was known to reside,

The icthiological series forms the third collection of this division, and consists of fish drawn from living or recent specimens chiefly caught in the Channel, at sea, off Madeira, on the west coast of Africa, on the east coast of South America, the West Indies, North America seas, lakes, and rivers; to these are added copies of nearly the whole collection in the Banksian library, which was obtained during Cook's voyages, a considerable number of the most remarkable in the collection of the Prince of Nassau at Berlin, and the Plumierian at Paris. Moreover, drawings from specimens in various museums and private collections. It consists at present of nearly one thousand figures, among which some that may have escaped the extensive researches of Baron Cuvier, whose elaborate work on this branch of Zoology is now in the course of publication.

In the closing series of the whole, are several drawings which do not belong to any of the foregoing. Among them an interesting subject of a great Boa Cenchris, (Aboma) a series of Crocodiles, Sepiadæ, Mollusca, and Lepidoptera; the first of these were intended to exemplify new species in each of the sub-genera, and the second shows several colossal species of Sepia and Loligo, which do not appear to have been circumstantially described.

In this abstract I may have been too diffuse on some subjects, and not sufficiently so on others; judging that what was deemed to be least known would tolerate a more detailed explanation—I did not call your attention much to the long series of views, nor to Zoological subjects, the nature of which must be similar in a great measure to all other collections of the like character. But the costumes of nations having some claim to originality, and certainly a much greater to industry and research, could not, it appeared, be submitted in their true light without explaining the view taken of them, and the circumstances and principles which attended the execution.

Notwithstanding many, perhaps unavoidable, oversights and defects, in the manner as well as the matter of this still incomplete accumulation of documents—those who are desirous of forming a more correct notion of much of the habits and customs of our ancestors, and of other nations in different ages—those who wish to view something of the carriage and portraiture of many among the celebrated personages of our national history, will find something to give this seductive desire of our fancies, " a local habitation and a name "—hence artists who seek for their historical conceptions—that impress of character and truth which is the surest vehicle of the great and beautiful—will here find abundance of materials, with anthorities to establish their degree of authenticity.

Lockyer-street, Plymouth,
9th Nov. 1829.

IX.

ON THE ORNITHOLOGY OF THE SOUTH OF DEVON; BY EDWARD MOORE, M. D. F. L S. AND MEMBER OF THE PLYMOUTH INSTITUTION; IN A LETTER TO THE PRESIDENT.

Sir,

THE Transactions of this Institution will doubtless be expected to contain some observations on subjects of science, which admit of illustration in our own immediate neighbourhood; and, as in a work of this nature, we should not be negligent of any means which may afford information to the inquirer, I have been induced to offer a list or catalogue of the different species of birds, which are to be met with in the south of Devonshire. I am not aware that any thing of the kind has hitherto been published—the various writers on the history of the county, (except perhaps Polwhele,) have not made Ornithology an object of much regard—and it is chiefly from one or two scientific men who have particularly devoted themselves to it, that we are to derive most of our information on the subject: I know of no one, who in pursuit of British Ornithology, has conferred greater benefits on the Natural

History of our own county, than the late Col. Montagu, of Kingsbridge, author of the "Ornithological Dictionary."—Another work, "Ornithologia Danmoniensis," was commenced in 1809, by Dr. A. G. Tucker, of Ashburton, but not continued. A catalogue of the birds of Dartmoor was furnished by this gentleman towards the illustration of Carrington's poem, published in 1826.

A taste for Ornithology, however, has not been wanting in many parts of the county, and many gentlemen have made considerable collections, but their observations have seldom been made known, and valuable specimens have often been lost for want of attention; many of these, however, still exist; the most perfect museums are those of Mr. Comyns, of Mount Pleasant, near Dawlish; of Rev. Mr. Vaughan, of Aveton Giffard; and of Dr. Magrath, of Plymouth; other gentlemen have recently turned their attention to the subject, whose names I shall have to refer to, as I proceed.

The whole of the county of Devon, and its southern division in particular, affords peculiar facilities for the pursuit of this investigation; in no district perhaps, of equal space, is there such a variety of country calculated to be selected, as places of resort, by the feathered tribes; whatever is to be expected from mountain or valley, river or sea, is here to be met with. Nearly in the centre of the county are the wild and barren heights of Dartmoor, and throughout the whole of the district termed the South Hams, we may observe a continued succession of hill and vale; the latter of which is particularly abundant in wood, and the country is intersected by numerous rivers, most of which take their rise from the higher regions of the moor. Twelve of the principal—the Axe, the Sid, the Otter, the Dawl, the Teign, the Dart, the Avon, the Erme, the Yealm, the Plym, and the Tamar, besides the inlet of Salcombe, discharge their waters into the British Channel, while the whole line of coast, extending upwards of sixty miles, is diversified with bays, marshes, sands, and insulated rocks, calculated to afford protection to the different tribes of sea fowl.

Independently of the species which may be considered indigenous to the country, there are many which visit us in their peregrinations from one climate to another; and any unusual variation in the winds, or their long continuance in one direction, will give us an opportunity of occasionally discovering some rare kinds of birds. Our extensive line of coast is favourable in this view, and we accordingly find that many of the rarest species have been found in Devonshire after a storm. In October, 1829, after a long and continued south-westerly wind two or three black-toed Gulls, Phalaropes, and young Terns, were procured; the Stormy Petrel, Little Auk, &c. have been some times obtained far inland, doubtless owing to similar causes, and as they are generally found in a weak or starving condition on those occasions, we may infer that the turbulent state of the sea, when of several days' duration, renders them incapable of procuring food, and thus drives them to the shore.

It is a subject of remark that many birds, which formerly existed in great numbers here, are now seldom to be met with, or have entirely disappeared; the Egret and Crane are become almost unknown, only one specimen of the latter has been obtained for many years; the Kite forty years ago was very common, but now I cannot find a specimen in any collection in this district, and Montagu remarks that he only saw one during twelve years' residence in the south of Devon. Our rivers formerly abounded in Wild Duck and Teal; but these are considerably diminished in number;—the causes may doubtless be ascribed to the increased population, drainage of marshes, or the systematic pursuit of wild fowl for the table, and probably most of all to the usual mildness of our winters; since in the present year (1830,) the severe weather of the month of January has furnished us with great abundance of Wild Swans, Geese, and many rare species of the Duck tribe. In the arrangement of the species in the following catalogue I shall follow the system of Cuvier, ("Regne Animal," 2nd edition, 1829,) and in describing the synonyma of the species, I shall chiefly adopt those of Temminck, ("Manuel d'Ornithologie," 2nd edition.) When first attention was paid to Ornithology, every difference of plumage was thought sufficient to constitute a difference of species, until it was discovered that the same bird frequently assumed a new livery at the moulting season in autumn; and even this information was not capable of exposing the secrets of nature, until the universal thirst for investigation over the greater part of the globe, led to a desire to examine the species at the situations of their habitual haunts, which has furnished us with the knowledge that not only do the greater number of birds undergo a change of plumage in autumn, but also in the spring, and that frequently the difference is so great, that it effects a complete metamorphosis of the individual, rendering it extremely difficult to detect; this is exemplified in the Tringa pugnax, or Fighting Ruff, the male of which is furnished with a large ruff about the neck, during the three months of the breeding season only, and afterwards losing it, has been repeatedly mistaken for three or four other species. In the same way the Knot has been multiplied into six species; and the greater number of the Sand-piper tribe have been equally mistaken. Moreover, young birds have a plumage often differing from their parents, more especially from the male; and in many cases do not acquire their adult appearance for three or four years, as is observed, particularly in the Gulls. From these causes the labours of later naturalists have been directed, not only to obtain an acquaintance with new species, but also to rectify the errors which a want of this information had occasioned in the Linnean system—errors which the edition pnblished by Gmelin tended to augment. "Le seul catalogue general des animaux, (says Cuvier, p. 6.) que l'on possédât alors, et que l'on ait encore aujourd'hui, le système de Linnæus, venait d'être disfiguré par un editeur malheureux,qui ne s'etait pas même donné le soin d'approfondir les principes de cet ingenieux Methodiste, et qui, partout ou il avait rencontrē quelque dēsordre, avait semblē faire des efforts pour le rendre plus inextricable." The identification of species has been very successfully pursued, especially by Temminck and Montagu; so that many which were uncertain are now properly arranged beyond the possibility of doubt. It is not however my intention to give an enlarged view of the subject of Ornithology, as that would be incompatible with the object of this work, and is indeed fully detailed in the different standard publications. And while I forbear to enter into a detailed account of the habits or even description (except in particular instances,) of the birds I have to mention, I shall consider it sufficient for me to speak of the species itself, and give the authority by which it is to be considered a production of this neighbourhood, which will be done by a reference to approved works, or to individual specimens at present existing in the collections of gentlemen, whose names I shall assume the liberty of stating; while those which I possess myself, will be distinguished by my initials being attached to them.

My opportunities have not enabled me to extend my inquiries much into the north of Devon, but I am not aware that any species have been found there, beyond what belong to the south, except the Nucifraga Caryocatactes (Corvus Caryocatactes, of Gmelin) Nutcracker Crow, of which one specimen is mentioned by Montagu as having been obtained in that part of the county: the Alca impennis, or Great Auk, a specimen of which, (Mr. Gosling informs me,) was picked up dead near Lundy Island; and the Ardea Minuta, Little Bittern, obtained near Crediton, in May, 1808. (Montagu's Ornithological Dictionary.)

CLASS.—AVES.

Order 1.—BIRDS OF PREY.

Fam. 1.—DIURNAL.

Gen.—FALCONS.

Sect. i.—*NOBLE BIRDS OF PREY.*

Sub-genus—(True Falcons.)

Species 1.—COMMON FALCON, { Falco communis. *(Gmelin.)*
{ Peregrine, or } ——— peregrinus.
{ Barbary Falcon } ——— barbarus.
{ Yearling Falcon

The Peregrine and Barbary Falcons are the common Falcons in different states of moult, *(Cuvier Regne Animal*, ed. 1829, p. 320.) Dr. Shaw and Montagu have considered the Lanner a variety of this bird; but *Cuvier* observes that it is distinct, and that it approaches the character of his genus, Hiero-falco *(Jer-falcon.) Temminck* also considers the true Lanner of *Linneus* to be a distinct species, *(Manuel d'Ornithologie*, ed. 2, p. 23.*)*—the Yearling Falcon is the young. It breeds in our woods, and specimens are not unfrequently met with. Mr. Rowe, of Plymouth, has two; and Mr. Drew, of Devonport, two in his collection.

Sp. 2.—HOBBY FALCON.—Falco subbuteo. *(Lin.)*

Breeds in the woods in this neighbourhood: arrives in spring, and leaves us about October. Dr. Isbell, of Stonehouse, has two specimens; and Mr. Drew one.

Sp. 3.—The MERLIN, { Falco æsalon, *(Lin.)*
or Stone Falcon { ——— litho falco. *(Lin.)*

Visits us in winter only: a specimen in Drew's collection. The Stone Falcon of *Latham* is the old male. *(Temminck.)*

Sp. 4.—The KESTREL.—Falco tinnunculus.

Very common; builds in the cliffs on the sea-coast, particularly at Wembury, near Plymouth;—specimens in my collection. E. M.

Sect. ii.—*IGNOBLE BIRDS OF PREY.*

GEN.—EAGLES.

Subg.—(True Eagles.)

Sp. 5.—COMMON EAGLE, Ringtail Eagle, or Golden Eagle, { Aquila heliaca. (*Savigny.*) Falco fulvus. (*Gm.*) —— chrysaetos. (*Gm.*)

Cuvier has continued the F. fulvus and F. chrysaëtos as distinct species, yet *Temminck* in noticing the circumstance, declares them to be the same at different ages. The F. chrysaëtos, Golden or Royal Eagle, is the old bird.—The Aquila fulva of *Meyer;* Ring-tail of *Latham,* (sp. 6,) or the F. fluvus, melanætos and niger of *Gmelin,* and Common Eagle of *Cuvier* is a young bird of the first year. These birds have been frequently met with in England, but rarely in the south; yet I am informed, that some years since, a pair of them built on Dewerstone rock, in Bickleigh vale, near Plymouth.

Subg.—(Fishing Eagles.)

Sp. 6.—SEA-EAGLE, Osprey-Eagle, or Cinereous Eagle, { Haliætus leucocephalus, (*Shaw's Z.*) Falco ossifragus; albicilla and albicauda. (*Gm*)

Rare; one of these birds was caught at the Eddystone a few years ago, and preserved alive for some time, by the late Addis Archer, esq. of Leigham; an accurate drawing of which I have seen in possession of Mr. Gosling.

Sùbg.—(Baldbuzzards.)

Sp. 7.—The BALDBUZZARD, or Osprey, { Pandion haliæetus. (*Shaw.*) Falcô haliætus. (*Lin.*)

Not uncommon; a fine specimen was shot on the Erme river, by R. Julian, esq, of Estover, and is now in that gentleman's collection. Mr. Comyns has one, shot on the Exe. *Montagu* says it is more common in Devonshire than in any part of the kingdom.

Subg.—(Goshawks.)

Sp. 8.—Common Goshawk, { Astur palumbarius. (*Shaw.*) Falco palumbarius. (*Lin.*) }

Very rare: but has been found on Dartmoor, according to Dr. Tucker. *See Carrington's Dartmoor.*

Sp. 9.—Sparrow Hawk { Nisus. (*Cuv.*) Falco nisus. (*Lin.*) }

Common all the year—specimens in my own collection—E. M.

Subg.—(Kites.)

Sp. 10.—Common Kite, or Glead, { Milvus ictinus. (*Shaw.*) Falco milvus. (*Lin.*) }

This bird was extremely frequent here about forty or fifty years ago, as I am informed by some diligent Naturalists: but it is now become extremely rare. *Montagu* says, that in twelve years' residence in Devonshire, he only observed one of the species. (Orn. Dict. Sup.) I have not found a specimen in any collection, but it has been seen on Dartmoor. *Carrington's Dartmoor.*

Subg.—(Honey-buzzard.)

Sp. 11.—The Honey-Buzzard { Pernis apivorus. (*Shaw.*) Falco apivorus. (*Lin.*) }

Very rare; one was seen by the Rev. Mr. Holdsworth, on Slapton Ley, pursuing Dragon flies; *Montagu.* It has been noticed also on Dartmoor. *Carrington.*

Subg.—(Buzzards.)

Sp. 12.—Common Buzzard, { Buteo vulgaris. (*Shaw.*) Falco buteo. (*Lin.*) }

Very common here; erroneously termed Kites by the common people. E. M.

Subg.—(Moor-Buzzards.)

Sp. 13.—HEN-HARRIER, Ring-Tail (female) { Circus pygargus. (*Shaw.*) Falco-pygargus, and Cyaneus. (*Lin.*) }

The Falco cyaneus, or Hen-harrier, was long suspected to be the male of the Ring-tail; and this was proved to be the case by *Montagu.* (Vide Linnean Transactions, vol. 9. and Orn. Dict. Sup.) I possess a pair of these birds, shot at the same time with a double barrel, by R. Julian, esq. and the female dropped an egg as she fell. The Falco-griseus, or Grey Falcon of *Linneus* is, according to *Temminck,* a young male passing to the adult state. E. M.

Sp. 14.—ASH-COLOURED FALCON { Circus cineraceus? Falco cineraceus. (*Montagu.*) }

Discovered by *Montagu;* shot in 1803, near Kingsbridge; again in 1808, by Mr. Templer's game-keeper at Stover. A nest was obtained from a furze-brake by Dr. Tucker, of Ashburton; the female is of a brown colour, but the under parts more ferruginous, and the colours brighter than in the Ring-tail or female Hen-harrier—probably leaves us in winter.*

Sp. 15.—HARPY; Moor-Buzzard, or Marsh-Hawk. { Circus æruginosus. *Shaw.* Falco rufus. (*Lin.*) }

The Falco rufus of *Latham,* is, according to *Temminck,* the young bird of the first year; of which a specimen shot at Wembury, is in possession of Mr. J. Whipple, surgeon of this town. The Falco æruginosus, or Moor Buzzard of authors, is the same bird after its second moult. *Temminck Manuel,* p. 71. It has been obtained at Shaugh, and Whittleborough down, near Plymouth; and I am informed by the warreners on Dartmoor, that it is not uncommon, and commits great depredations among their rabbits.

* Vide Ornitholog. Dict. Sup.; and Lin. Trans.

Fam. 2.—Nocturnal Birds.

Gen.—STRIX.—(*Lin.*)

Subg.—(Ear-Owls.)

Sp. 16.—Long-eared Owl. { Otus Europœus. (*Shaw.*) Strix otus. (*Lin.*) }

This bird has been obtained at Leigham, near Plymouth: builds in trees surrounded with ivy, and rests much on the ground—a specimen in Drew's collection.

Sp. 17.—Short-eared Owl, { Otus brachyotos. *Shaw.* Strix brachyotus. *Gmn.* }

Termed also the Woodcock-owl, from its being supposed to arrive with the Woodcock. I possess a specimen, which was shot March 13th, 1829: one in Mr. Rowe's collection. E. M.

Subg.—(True Owls.)

Sp. 18.—White Owl.—Strix flammea. *Lin.*

Very common. E. M.

Subg.—(Howlets.)

Sp. 19.—Brown or Tawny Owl, { Syrnium stridulum. *Sh.* Strix Aluco, and Stridula. *Lin.* }

Very common; a male and female were caught in a dove-cot, and presented to me by the Rev. Walter Radcliffe, of Warleigh; it is the only species which hoots, and chiefly at night. E. M.

Subg.—(Horn Owls.)

Sp. 20.—Great-eared Owl or Eagle Owl. { Bubo microcephalus. *Shaw.* Strix bubo. }

A very rare species with us; I have seen one specimen near Honiton in 1820.

Subg.—(Night Owls.)

Sp. 21.—LITTLE OWL, { Noctua pygmæa. (*Shaw.*) / Strix passerina. (*Gmn.*) }

Very rare; one specimen, procured here, was sent to Mr. Drew to be prepared: another was shot by Mr. Comyns, a few years since, near Dawlish.

Order 2.—PASSERINE BIRDS.

Fam. 1.—DENTIROSTRES.

Gen.—SHRIKES.

Subg.—(True Shrikes.)

Sp. 22.—COMMON OR GREAT SHRIKE, or Butcher Bird, { Lanius excubitor. *Lin.*

A very rare bird in England. *Montagu* saw two which were shot in Wiltshire. "One of them was seen in February, 1830, about the plantations at Ham, near Plymouth, the residence of Mrs. Collins." (See also *Carrington's Dartmoor.*)

Sp. 23.—RED-BACKED SHRIKE, or Butcher Bird { Lanius collurio. *Gmn.*

This bird is very frequent here in summer, arriving in May, and departing in September. E. M.

Gen.—THE FLY-CATCHERS.

Subg.—(True Fly-catchers.)

Sp. 24.—SPOTTED FLY-CATCHER.—Muscicapa grisola. *Gmn.*

Common; arrives in spring, and departs in September. E. M.

Gen.—THE COTINGAS.

Subg.—(The Chatterers.)

Sp. 25.—BOHEMIAN CHATTERER, or Waxwing, { Bombycilla Bohemica. *Sh.* / Ampelis garrulus. (*Lin.*) }

Is occasionally obtained in this neighbourhood, in its passage from the north, where it is said to build near the Arctic Circle. *Temminck* says, it is only accidentally found in the temperate parts of Europe, from Nov. to Jan. (*Manuel.*) A specimen, shot here, Jan. 1829, is in Mr. Drew's collection. Mr. Rowe, of Plymouth, and Mr. C. Tripe, of Devonport, also possess specimens. Another was shot in Boringdon Park, in this neighbourhood. (T. E. Gosling, esq.)

Gen.—THRUSHES.

Subg.—(True Thrushes.)

Sp. 26.—Common Black Bird.—Turdus merula. (*Lin.*)

Very common; I possess a variety of the male—the bill and feet yellow, and the entire plumage of a dull cream colour—shot at Warleigh, and presented by the Rev. W. Radcliffe. A similar one is in the collection of I. Comyns, esq. Mount Pleasant, near Dawlish. E. M.

Sp. 27.—Ring Ouzel, or Michaelmas Bird. } Turdus torquatus.

This bird arrives here in April, and departs in October. *Mr. White,* (History of Selborne) remarks that these birds are seen in flocks on the coast of Sussex, in April, and October, where they remain about three weeks only—they build on the borders of Dartmoor, where they have been seen to enter holes in the rocks, by R. Julian, esq. who possesses a specimen, shot Sept. 1829. I am informed by George Leach, esq. that he has shot great numbers of them on the moor, during the summer.

Sp. 28.—Missel Thrush, or Holmscreech, } Turdus viscivorus. *Lin.*

Common here; frequenting woody districts; in winter they are seen in small flocks of five or six—probably the entire brood. E. M.

Sp. 29. Fieldfare.—Turdus pilaris. (*Lin.*)

Arrives in large flocks about October, and departs in February or March. E. M.

Sp. 30.—Thrush, or Mavis, { Turdus musicus.

Common all the year—a white variety in Mr. Comyn's collection; and another, with a white spot occupying the back of the neck and shoulders, in Dr. Magrath's possession. E. M.

Sp. 31.—Redwing.—Turdus iliacus.

Common in winter; arriving and departing with the Fieldfares. E. M.

Subg.—(The Water Ouzels.)

Sp. 32.—Water Ouzel, { Cinclus aquaticus. (*Tem.*)
Turdus cinclus. (*Latham.*)
Sturnus cinclus. (*Lin.*)

Breeds in Devonshire, and continues all the year; *Montagu* says, it uses its wings in swimming under water; but that it cannot swim on the surface, and doubts if it ever walks at the bottom. I have frequently seen it on the higher branches of the Plym, about Bickleigh vale. E. M.

Gen.—THE GRACKLES.

Sp. 33.—Rose-coloured Ouzel, or Thrush, { Gracula Rosea? (*Cuv.*)
Turdus Roseus. (*Lin.*)
Pastor Roseus. (*Tem.*)

Is an extremely rare bird; inhabiting the warmer parts of Asia and Africa, and passing regularly through Italy and Spain, but very rare in other places.—(*Temminck Manuel.*) One was killed in Oxfordshire, in 1794; and I am informed by the Rev. Kerr Vaughan, that a pair were shot in the garden of the Rev. E. Edmonds, near Aveton Gifford, which he sent to the British Museum.

Gen.—THE ORIOLES.

Sp. 34.—Golden Oriole.—Oriolus galbula. (*Lin*)

This rare bird has been occasionally met with here in the spring; it is rather common in Holland and France, says *Temminck*, where it congregates in winter; specimens have occasionally been sent to Mr. Drew for preservation; one was shot by R. Julian, esq. in this neighbourhood. They have been also seen at Leigham and Mount Edgcumbe.

Gen.—THE SOFT-BILLS.

Subg.—(The Stone-Chats.)

Sp. 35.—Stone-Chat, or Moor-Titling, { Saxicola rubicola. (*Bechstein.*) Motacilla rubicola. (*Lin.*) }

Remains with us the whole year; numerous along the sea coast. E. M.

Sp. 36.—Whin-Chat, or Furze-Chat, { Saxicola rubetra. (*Bechstein.*) Motacilla rubetra. (*Lin.*) }

Is not so numerous as the former, and disappears in winter. A pair in Mr. Drew's collection.

Sp. 37.—Wheatear, or White-rump, or English Ortola, { Saxicola œnanthe. (*Bechstein.*) Motacilla œnanthe. (*Lin.*) }

Common in summer; migrates in winter. *Montagu* observes that it is by no means common in Devon or Cornwall in the breeding season: in the neighbourhood of Plymouth, however, the are exceedingly numerous; particularly along the water side, by the Plymouth Embankment, Mount Batten, and the banks of the Tamar.—E. M.

Subg.—(The Redbreasts.)

Sp. 38.—Redbreast, { Sylvia rubecula. (*Lath.*) Motacilla rubecula. (*Lin.*) }

Common.

Sp. 39.—RED-START, or Red-tail, { Sylvia phœnicurus. *(Lath.)* Motacilla phœnicurus. *(Lin.)*

Rather rare; appears here in the summer; has been often seen at Leigham.

Subg.—(The Fauvettes.)

Sp. 40.—NIGHTINGALE, { Curruca luscinia. *(Shaw.)* Motacilla luscinia. *(Gm.)* Sylvia luscinia. *(Lath.)*

This bird is found as far north as Sweden, and emigrates in winter to Egypt and Syria.—*(Tem.)* It is frequent in the central parts of England in summer, but rarely seen in Devonshire; is occasionally noticed near Exeter; and *Montagu* heard it once on the 4th May, 1806, near Kingsbridge, Devon. (Orn. Dict. Sup.)

Sp. 41.—REED WREN, or Reed Warbler, { Curruca arundincea. *(Shaw.)* Motacilla a——— *(Lin.)* Sylvia a——— *(Lath.)*

Very rare; seldom seen farther west than Somersetshire; but is marked a Devon bird, in *Carrington's Dartmoor*.

42.—SEDGE WARBLER, or Sedge Bird, { Curruca salicaria. *(Shaw.)* Motacilla salicaria. *(Lin.)* Sylvia phragmitis. *(Bechstein.)*

Distinguished from the Reed Wren, by having a white streak over the eye: visits us in summer. I have one, shot in May. E. M.

43.—GRASSHOPPER WARBLER, or Grasshopper Lark, { Curruca locustella. *(Shaw.)* Motacilla nævia. *(Gm.)* Sylvia locustella. *(Tem.)*

Found, though rarely, in the south of Devon. (*Montagu.*) Specimens are in possession of the Rev. Mr. Vaughan, and of Mr. Gosling, of Leigham.

Sp. 44.—THE BLACK CAP, or Mock Nightingale, { Curruca atricapilla. *(Shaw.)* Motacilla atricapilla. *(Lin.)*

Arrives in April, and departs in September: is not uncommon; frequents woods and gardens; a specimen in Drew's collection—the head of the female is rust colour.

Sp. 45.—THE PETTYCHAPS, or Fauvette, { Curruca Orphea. (*Tem.*) Sylvia hortensis. (*Bechstein.*)

Frequents our woods; arrives in April, and sometimes remains to October—it is considered rare; but *Montagu* found them on the banks of the Avon; and I have shot it in Bickleigh vale, near Plymouth; a specimen is also in Mr. Rowe's collection. E. M.

Sp. 46.—THE WHITE THROAT, or Nettle Creeper, { Curruca Sylvia. (*Shaw.*) Sylvia cinerea. *Lin.*

Very common; arrives in April, and departs in Sept. E. M.

Sp. 47.—DARTFORD WARBLER, { Curruca ferruginea. *Cuvier?* Sylvia ferruginea.—*Roux.* Sylvia Dartfordiensis.—*Latham.* Melizophilus Dartfordiensis. *Leach.*

Stated by *Montagu* to be by no means uncommon in the south of Devon, where it continues the whole year. (Lin. Trans.) It frequents furze-brakes; is found in Bickleigh vale, (R. Julian, esq.) and I have seen it in the neighbourhood of Withy-hedge, Plymouth—one in Mr. Drew's collection.

Subg.—(The Hedge Sparrows.)

Sp. 48.—HEDGE WARBLER, or Hedge Sparrow, { Accentor modularis. *Bechs.* Motacilla modularis.

Very common all the year.

Subg.—(The Gold-crests.)

Sp. 49.—GOLDCRESTED WREN { Regulus vulgaris.—(*Shaw.*) Motacilla regulus.—*Lin.*

Common among the fir-plantations all the year. E. M.

Sp. 50.—YELLOW WREN, Willow Wren, or Ground Wren, { Regulus trochilus. (*Shaw.*) Motacilla trochilus. *Lin.*

Common; arrives in April, and departs in September. E. M.

Sp. 51.—LESSER PETTYCHAPS, or Chiff-Chaff, { Regulus ——— (*Cuv.*) Motacilla hypolais. (*Bechstein.*) Sylvia hypolais. (*Latham.*) }

Common from April to October; it has been occasionally known to remain with us through the winter.

Sp. 52.—WOOD WREN, { Regulus ——— (*Cuv.*) Motacilla sibilatrix. (*Gmn.*) Sylvia sibilatrix. (*Lath.*) }

Frequents our woods; arrives in April and departs in October. E. M.

Subg.—(The Wrens.)

Sp. 53.—COMMON WREN, { Troglodytes Europæus. *Shaw.* Motacilla troglodytes. (*Lin.*) }

Common; a white variety in possession of I. Comyns, esq. another in the British Museum. E. M.

Subg. (The Dishwashers.)

Sp. 54.—WHITE WAG-TAIL.—Motacilla alba. (*Lin.*)

Common all the year; but I have noticed them in flocks about August, after which their number is considerably lessened, and possibly some of them might migrate. E. M.

Subg.—(The Wag-tails.)

Sp. 55.—SUMMER WAG-TAIL, or Yellow Wag-tail, { Budytes ——— (*Cuv.*) Motacilla flava. (*Lin.*) }

Common in summer only; on the 15th August, 1828, immense flocks of them appeared along this coast, feeding on the sea shores, and they remained in the neighbourhood about a fortnight, after which no more were seen. E. M.

Sp. 56.—GREY WAG-TAIL, Winter Wag-tail { Budytes ——— (*Cuv.*) Motacilla boarula. (*Lin.*) }

These birds appear generally about October: and although *Montagu* observes that he has never been able to find them in summer, yet I believe with *Dr. Tucker*, that they occasionally do breed here; as I have seen a pair in June, in the neighbourhood of Buckland Abbey; and Mr. Gosling, of

Leigham, informs me, he has sometimes found the nest—they remain with us till spring. E. M.

Subg.—(The Tit-larks or Pipits.)

Sp. 57.—Pipit Lark, Field Lark, Tree Lark, { Anthus arboreus. (*Bechstein.*) Alauda trivialis. (*Lin.*) Alauda minor. (*Gm.*)

Montagu declares the Pipit to be no other than the common Tit-Lark, in its winter plumage—(Vide Orn. Dict. Sup. and Appendix;) if so, it is found here—but *Temminck* considers them distinct, from a difference in the claw of the back toe, which in this is shorter than the toe, and curved to a quarter of a circle; whereas in the Tit-Lark, it is longer and slightly arched—he considers it the Field Lark of *Latham*, sp. 6.

Sp. 58.—Tit-Lark, { Anthus pratensis. *Bechs.* Alauda pratensis. (*Gm.*)

Common all the year; changes its plumage in winter to a more brilliant hue, which has given rise to much confusion. E. M.

Sp. 59.—Rock Lark—*Montagu.* Meadow Lark—of *Latham.* Dusky Lark—*Lewin.* { Anthus Aquaticus. *Bechs.* Alauda petrosa. *Lin. Trans. v.* 4. —Obscura

The Rock Lark of *Montagu* is common all the year on our shores. I have taken *Temminck's* authority for considering it to be the same as the Meadow Lark of *Latham.*—(Var. A.—Syn. 4. 378.) E. M.

Fam. 2.—Fissirostres.

Gen.—SWALLOWS.

Subg.—(The Martlets.)

Sp. 60.—Swift, or Black Martin, { Cypselus vulgaris. (*Stephens.*.) Hirundo apus. (*Lin.*)

Common; they arrive later and depart earlier than the Swallows.

Subg.—(True Swallows.)

Sp. 61.—HOUSE SWALLOW, or Martin, } Hirundo urbica. (*Lin.*)

Common; arrives a little after the Swallow. Mr. White, (History of Selborne,) states that he found some of these birds feeding their young as late as the 29th of September; and as their usual time of departure is the 4th or 5th of October, he considers that the young could not then be strong enough to fly, and must remain here; he saw a flock on the 7th of November, and one bird on Christ Church Tower, Oxford, November 20th, and another on the 26th. I have seen the old birds feeding their young on the 20th of September, 1828, at Warleigh, near Plymouth; and have been assured by a good observer, that Martins have frequently been seen flying during mild weather even in the Christmas week, at Plymton. These birds build in the hollows of the rocks under Wembury cliffs, as well as about the houses in this neighbourhood. E. M.

Sp. 62.—CHIMNEY SWALLOW.—Hirundo rustica. (*Lin.*)

Common; arrives about the first week in April, and departs usually about the last of September; though there cannot be a question but that some of them are often found here in winter in a torpid state, from which Mr. White supposes they sometimes revive, from their being seen in December, on a fine day by Mr. Markwick, who observed two on the 8th. Some years ago, six or seven of these birds were found torpid, on taking down a pile of deal boards, in this town;—and an account of five being found on the 28th of November, 1826, in a torpid state, from which they were recovered by warmth, is to be found in the Edinburgh Journal of Science, vol. 15, and in vol. 17, p. 291, is recorded a singular fact, viz. that Swallows are seen all the year round in the vicinity of the furnaces at the Carron Iron-works. Mr. White states that these birds all leave at one and the same time; but this is not always the case, as I have noticed the departure of successive flocks, on the 11th and 12th of September, 1828; after which, none were seen till the 22nd and 23rd, when another flock departed; these had been accompanied by Martins, Swifts, and Sand-Martins, but on the 26th, a fresh flock began assembling on the Leat, near Plymouth, which was composed only of Swallows and Martins; and on October the 2nd, these disappeared, after which only a few stragglers were seen, on the 4th and 6th. It has long been questioned where the Swallows roost at night, after leaving their nests;—Mr. White observes that he noticed them settling in the willow-beds of the Thames. It appears also that they sometimes settle among the heaths, as Mr. R. Julian informs me that he once observed them about dusk, on riding over a down near Plymouth; an immense flock rushed by him, flying low, and not uttering a twitter, and at length settled in the low brushwood of a plantation. A white variety is in the collection of Mr. Comyns. E. M.

Sp. 63.—Sand Martin, Bank Martin, Shore Bird, } Hirundo riparia. (*Lin.*)

Common; arrive about the second week in April, and have been sometimes seen as late as the 15th of November. They build in the sandy headlands at Thurlstone cliffs, and also on the banks of rivers; during the breeding season they are very shy. I fired at one of them in June 1828, as it was leaving its nest on the banks of the Plym, near Leigham; and though there were many nests in the place, the whole flock forsook the spot, and did not return for that season. E. M.

Gen.—THE GOAT-SUCKERS.

64.—Common Goatsucker, or Night-jar, } Caprimulgus Europæus. *Lin.*

Not uncommon; appears about the first week in May, and departs in October; yet in mild seasons they are seen later. *Montagu* speaks of one he shot near Kingsbridge, November 8th, 1805, and I saw a pair in an orchard, near South Milton, November 10th, 1828. They are not uncommon about Slade, from whence I obtained a pair, shot by Capt. Pode. Mr. Comyns has one, with the neck, wing-spot, and tail white. E. M.

Fam. 1.—CONIROSTRES.

Gen.—LARKS.

Sp. 65.—SKY-LARK.—Alauda arvensis. *(Lin.)*

Common all the year; a white variety is in the possession of Mr. Prideaux, of Plymouth. E. M.

The Crested Lark, or Alanda cristata of authors, is esteemed by English writers to be the same as this bird, for as the Sky-Lark occasionally erects its crest, it has been supposed to have given rise to a mistake in the species; however, *Cuvier* and Temminck consider there is a distinct species, and the latter author holds it synonimous with the Crested and Undated Lark of Latham, and with la Coquillade of Buffon.

Sp. 66.—WOOD LARK, Lesser crested Lark, { Alauda arborea. *(Lin.)* ——— nemorosa. *(Gmn.)*

Common all the year; often seen in pairs in winter: it has long feathers on the head capable of being erected into a crest; and is, according to *Temminck*, the same as the Lesser crested Lark of *Latham*; Alauda nemorosa of *Gmelin*. E. M.

Gen.—THE TITMICE.

Subg.—(True Titmice.)

Sp. 67.—GREAT TITMOUSE.—Parus major. *(Lin.)*

Common all the year. E. M.

Sp. 68.—COLEMOUSE, or Cole Titmouse, { Parus ater. *(Lin.)*

Common all the year. E. M.

Sp. 69.—MARSH TITMOUSE.—Parus palustris. *(Lin.)*

Common all the year. E. M.

Sp. 70.—Blue Titmouse.—Parus cæruleus. (Lin.)

Common all the year. E. M.

Sp. 71.—Long-tailed Titmouse.—Parus caudatus. (Lin.)

Common all the year. E. M.

Subg.—(The Bearded Titmice.)

72.—Bearded Titmouse, {Parus Biarmicus. (*Lin.*) Calamophilus biarmicus. (*Leach.*)}

Rare; I am informed by Mr. Comyns, that the Bearded Titmouse is to be found in the willow beds opposite Topsham, on the Exe river—a specimen in the collection of C. Tripe, esq. Devonport.

Gen.—THE BUNTINGS.

Sp. 73.—Yellow Bunting, or Yellow Hammer, {Emberiza Citrinella. (*Lin.*)}

Very common all the year. E. M.

Sp. 74.—Cirl Bunting.—Emberiza Cirlus. (*Lin.*)

Not uncommon throughout the south of Devon, but particularly about Kingsbridge, where it was first discovered to be a British bird by *Col. Montagu*, in 1800.

Sp. 75.—Reed Bunting, Reed Sparrow. {Emberiza Schœniculus. (*Lin.*)}

Not uncommon. E. M.

Sp. 76.—Common Bunting.—Emberiza miliaria. (*Lin.*)

Very common. E. M.

Sp. 77.—Snow-Bunting, {Plectrophanes nivalis. (*Meyer*) Emberiza nivalis. (*Lin.*)}

Very rare; sometimes found on Dartmoor. (*Carrington's Dartmoor.*) The Tawny Bunting (Em. mustelina,) and Mountain Bunting (Em. montana,) are considered by *Cuvier* to be the same as the Snow Bunting in different states of plumage. *Temminck* says that they are the young;—*Capt. Sabine* is of a similar opinion, (Linnean Transactions, vol. 12.) *Montagu* however maintains them to be distinct; and although he allows he "has less scruple in considering the possibility of the Snow and Tawny Buntings being of the same species, yet he cannot admit so much in regard to the Mountain Bunting, or Lesser Brambling." (See Orn. Dict. sup. Appendix.) *Mr. Stephens* follows on the same side of the question. (See Shaw's Zoology, vol. 9.) I shall therefore consider the point not fully established, and pass on to the Tawny Bunting, supposing it for the present to be distinct.

Sp. 78.—Tawny Bunting, or Greater Brambling, } Emberiza mustalina. (*Gmn.*) ——— glacialis. (*Lath.*)

Not uncommon in hard winters in the south of Devon, according to *Montagu*, who speaks of one shot near the Start, October 20th, 1802; and of another caught in a net, near Plymouth, in 1807.

Gen.—THE SPARROWS.

Subg.—(True Sparrows.)

Sp. 79.—House Sparrow, } Pyrgita ——— (*Cuv.*) Fringilla domestica. (*Lin.*)

Common; Mr. Comyns has a white variety, shot at Thorverton, Devon.

Subg.—(The Finches.)

Sp. 80.—The Chaffinch.—Fringilla cœlebs. (Lin.)

Common. E. M,

Sp. 81.—The Brambling, Mountain Finch, } Fringilla montifringilla. (*Lin*)

Rare; but occasionally obtained here in winter. A specimen in Mr. Rowe's collection.

Subg.—(The Goldfinches.)

Sp. 82.—GOLDFINCH, or Thistlefinch, { Carduelis elegans. *Steph.* Fringilla carduelis. (*Lin.*)

Very common. E. M.

Subg.—(The Linnets.)

Sp. 83.—LESSER REDPOLE, { Linaria rubra. *Bechs.* Fringilla linaria. (*Lin.*)

Rather rare; only seen in winter, in flocks about alder trees.

Sp. 84.—GREATER REDPOLE, or Common Linnet, { Linaria cannabina. *Bechs.* Fringilla cannabina. (*Lin.*) ——— linota. (*Lin.*)

Common; the common Brown Linnet is the young of the Greater Redpole: and its plumage does not attain the mature state for two or three years, and not at all if kept in confinement. Mr. Comyns has a variety with the head white. E.M.

Sp. 85.—THE TWITE, or Mountain Linnet, { Linaria ——— (*Cuv.*) Fringilla montium. (*Lin.*)

Has been found in Devon, according to Polwhele.

Sp. 86.—SISKIN, or Abervine, { Linaria ——— *Cuvier.* Fringilla spinus. (*Lin.*)

Subg.—(The Gros-beaks.)

Rare; sometimes obtained here in winter. *Montagu* saw a small flock in December, 1805; one was shot near Plymouth, by R. Julian, esq. Two specimens are in Bolitho's collection, Devonport.

Sp. 87.—COMMON GROS-BEAK, or Hawfinch, { Coccothraustes vulgaris. *S.* Loxia coccothraustes. (*Lin.*)

Rare; visits England in autumn, and departs in April; a specimen in Drew's collection, was shot at Mount Edgcumbe. Mr. Rowe has another.

Sp. 88.—GREEN GROS-BEAK, Green Finch, or Green Linnet, { Coccothraustes chloris. *St.* Loxia chloris. (*Lin.*)

Common; congregates in winter. E. M.

Subg.—(The Bulfinches.)

Sp. 89.—The Bulfinch, or Hoop, { Pyrrhula Europæa. (*Stephens.*) Loxia pyrrhula. (*Lin.*)

Common all the year; Mr. Comyns has a variety quite black, and another entirely white, except the breast, which is roseate. E. M.

Gen.—THE CROSSBILLS.

Sp. 90—Crossbill. or Shell-apple, { Loxia curvirostra. (Lin.)

Rather rare; arrive generally in winter; formerly were numerous, but now only occasional small flocks are seen, and in some seasons, none at all. A few years ago, a male was shot in a garden in Plymouth, feeding on the berries of the mountain ash—specimens in Drew's collection, and at Ham.

Gen.—THE STARLINGS.

Sp. 91.—Common Starling.—Sturnus vulgaris (*Lin.*)

Common here in winter; arriving in flocks in October, and depart in spring, but some of them have been known to breed at Haldon, the seat of Sir Lawrence Palk; in the spring, the old birds have a yellow bill, and legs of a brown flesh colour. *Temminck.* They leave France in winter. *Cuvier.* Mr. Comyns has a specimen entirely white. E. M.

Gen.—THE CROWS.

Subg.—(True Crows.)

Sp. 92.—The Raven.—Corvus corax. (*Lin.*)

Common; builds on our rocky coasts; a specimen in Drew's collection, shot at Saltram. It may be easily tamed when young, and will descend at the call of its keeper, when flying in the air; one of this kind is now in possession of a gentleman at the Royal Naval Hospital, Plymouth.

Sp. 93.—Common Crow.—Corvus corone. (*Lin.*)

Common; a white variety in Mr. Comyns' collection.

Sp. 94.—Rook.—Corvus frugilegus. (*Lin.*)

Common; some of these birds have long established their nests on some trees, nearly in the centre of Plymouth. Mr. Comyns has one entirely white, except the scapulars.

Sp. 95.—Hooded or Royston Crow.—Corvus cornix. (*Lin.*)

Common about our coasts in winter, from October to April. A specimen in Mr. Rowe's collection.

Sp. 96.—Jackdaw or Chough.—Corvus monedula. (*Lin.*)

Common all the year; builds in our church towers, and along the sea cliffs, among the Gulls; thus at Bovisand bay, Wembury cliffs, and Plymton St. Mary tower. Mr. Comyns has one entirely white. E. M.

Subg.—(The Pies.)

Sp. 97.—The Magpie, { Pica Europæa. (*Stephens.*) / Corvus pica. (*Lin.*) }

Common; Drew's collection. A white variety is in possession of Mr. Comyns.

Subg.—(The Jays.)

Sp. 98.—The Jay, { Garrulus glandarius. (*Stephens.*) / Corvus glandarius. (*Lin.*) }

Common. E. M.

Fam. 4.—Tenuirostres.

Gen.—THE NUTHATCHES.

Sp. 99.—The Nuthatch.—Sitta Europæa. (*Lin.*)

Common all the year in woody situations. E. M.

Gen.—THE CREEPERS.

Subg.—(True Creepers.)

Sp. 100.—Common Creepers.—Certhia familiaris. (*Lin.*)

Not uncommon in our woods all the year. E. M.

Gen.—THE HOOPOES.

Subg.—(The Choughs.)

Sp. 101.—Red-legged Crow, or Cornish Crow, { Fregilus graculus. *Steph.* Corvus graculus. (*Lin.*)

Found on the coast of Cornwall all the year, but only occasionally seen on our shores; three specimens in Drew's collection. E. M.

Subg.—(The Hoopoes.)

Sp. 102.—The Hoopoe.—Upupa epops. (*Lin.*)

This beautiful bird is not unfrequently met with in Devonshire, and generally in autumn, though Mr. White, (*Selborne*) says that a pair once appeared there in the spring: one was shot at Warleigh, a few years since, another in Sept. 1828, on Kenton warren, which is in possession of J. Comyns, esq. and two killed about the same time at Bridestow, near Dartmoor, are in the collection of J. Newton, esq. of that place—another was shot near Edinburgh, at the same time. In the year 1827, a flock of them was seen at Saltram, by the Earl of Morley's gamekeeper, of which, two were shot—specimens in the collections at Ham, and those of Mr. Rowe, and Mr. Drew.

Gen.—THE BEE-EATERS.

Sp. 103.—The Common Bee-eater.—Merops apiaster. *Lin.*

This bird is common in Spain and Portugal, but occasionally obtained here in spring and summer, during their migration, as they are not known to breed here. The first specimen noticed was shot in July, 1794, in Norfolk; and a flight of twenty was seen in June, and again in October. (Linnean Transactions, vol. 3.) In April, 1818, a fine specimen was shot at Leigham, by Mr. T. E. Gosling; another in 1822 near Ivy-bridge. A flock of eleven were seen near Helstone, in Cornwall, in 1828, and were all captured. (See Plymouth Herald, June 7th, 1828.) One of these is in the museum of the Plymouth Athenæum, presented by G. S. Borlase, esq.—a specimen also in Mr. Rowe's collection.

Gen.—(THE KING-FISHERS.)

Sp. 104.—Common King-fisher.—Alcedo ispida. (*Lin.*)

Common all the year on the borders of our rivers; in winter they frequent the sea shores, feeding among the sea weeds, on the retreat of the tide. E. M.

Order 3.—THE CLIMBERS.

Gen.—THE WOODPECKERS.

Sp. 105.—Great Black Woodpecker.—Picus martius. *Lin.*

Very rare; said by *Latham* to have been found in Devonshire, though some doubts have been started on the subject. (See Montagu Orn. Dict.)

Sp. 106.—Green Woodpecker.—Picus viridis. (*Lin.*)

Common all the year; frequently brought to market. E. M.

Sp. 107.—Greater spotted Woodpecker.—Picus major. *L.*

Rather rare; *Cuvier* and *Temminck* have still described this and the P. medius of *Linneus*, as distinct; there is no doubt, however, but they are the same, as the nest of P. major was obtained by Lord Stanley, and the young birds answered the description of P. medius: (*See Montagu O. D. Supplement:*) specimens in collections of Mr. Rowe and Mr. Drew.

Sp. 108.—Lesser spotted Woodpecker.—Picus minor. *Lin.*

Rare; this bird is occasionally obtained from the neighbourhood of Oakhampton; a specimen from that place, in Mr. Drew's collection.

Gen.—(THE WRYNECKS.)

Sp. 109.—The Wryneck.—Yunx torquilla. *Lin.*

Rather rare; arrives here in summer only; is not uncommon in the neighbourhood of Dawlish, according to Mr Comyns, at whose residence I saw two fresh specimens in May, 1829; a specimen at Ham, was obtained near Plymouth.

Gen.—THE CUCKOWS.

Sp. 110.—Common Cuckow.—Cuculus canorus. *(Lin.)*

Common; arrives in April, remains till the first week in July; though the young have been occasionally seen as late as September. E. M.

Order 4.—GALLINACEOUS BIRDS.

Gen.—THE PHEASANTS.

Subg.—(True Pheasants.)

Sp. 111.—Common Pheasants.—Phasianus colchicus. *(Lin.)*

Common; it is not known when these birds were introduced into England; but they are now abundant, and full broods are often found wild in our neighbourhood; the female not unfrequently assumes the plumage of the male, even in a wild state; an instance occurred at Leigham, an account of which was published by *Dr. J. Butter*, of Plymouth, in the Wernerian Transactions. *Montagu* suspected it to arise from some change in the oviduct, and on dissection of one specimen found it obstructed. *Mr. Yarrell*, (Phil. Trans. 1827,) has shewn this to be true, and moreover, that the change may at any time be produced by obliterating that passage. Hybrids between the Pheasant and domestic Fowl have sometimes been noticed; an instance is mentioned by the Rev. Mr. White, (Naturalist's Calendar, 1795.) The Hon. George Herbert shot three of the kind in 1811, in the woods of Norfolk. (*Montagu.*) A living specimen is now in possession of Mr. Kelly, solicitor, of this town, obtained from a male Pheasant and common Hen, in a state of confinement; in its figure and general appearance, it approaches mostly the character of the Pheasant.

Hybrids between the Pheasant and Heath Grous, have been attempted, unsuccessfully, to be produced by the late Lord Carnarvon, according to *Montagu;* that such does, however, occur in nature, is now verified, since in this year (Sept. 1829,) one of this kind has been shot at Whidey, by the Rev. Mr. Morshead. A male Pheasant, female Grous, and one young, had been observed for some time in company; Mr. M. shot the Pheasant, and in a few days the young one, but the Grous escaped:—the young bird bears the marks of both parents, but the most prominent characters resemble the Grous; it differs however, from it in many points; the space above the eye is not bare on the upper lid as in the Grous, but that part is entirely feathered; the whole of the neck is covered with black feathers, somewhat mottled; the tail, instead of being somewhat forked, as in the female Grous, is fan-shaped, and half as long as in the Pheasant, the tarsi are not feathered, but bare, as in the Pheasant:—the colour is generally (except the neck) that of the Grous, and it has, also, the white spot on the shoulders.

The Ring Pheasant is a variety; of which I possess a specimen. E. M.

Gen.—THE GROUS.

Sp. 112.—BLACK GROUS, Black Cock, or Black Game. { Tetrao tetrix. *(Lin.)*

Not uncommon; formerly very numerous on Dartmoor and Exmoor; at present they are more scarce, though still preserved by Albany Saville, esq. near Oakhampton, they range over most of the woods in South Devon, in winter; specimens are in possession of Mr. R. Julian, Mr. Rowe and myself. E. M.

Gen.—THE PARTRIDGES.

Subg.—(True Partridges.)

Sp. 113.—COMMON PARTRIDGE, { Perdix cinerea. *Stephens.* Tetrao cinereus. *(Lin.)*

Common all the year. E. M.

Gen.—THE QUAILS.

Sp. 114.—Common Quail, { Coturnix dactylisonans. *Steph.*
Tetrao coturnix.

Not uncommon; this is a bird of passage, and usually remains with us in small numbers, during the summer only, departing about October; but in the severe weather of January, 1830, I purchased one in Plymouth market, proving that some may remain all the year; Mr. Comyns, Mr. Julian, and Mr. Rowe, have specimens also.

Gen.—THE PIGEONS.

Sp. 115.—Ring Dove, { Columba Palumbus. *(Lin.)*
Ring Pigeon,
Wood Pigeon,

Indigenous in England, congregates in winter; common here. E. M.

Sp. 116.—Stock Dove, { Columba œnas. *(Lin.)*
or Wild Dove,

Rather rare; appears in the south of England in flocks in winter. All attempts to domesticate these birds have failed; it was supposed that all the varieties of the Domestic Pigeon were derived from this bird, which by *Montagu* and others is considered to be the same as the C. livia, or Rock Dove; but *Cuvier* and *Temminck* consider them as distinct.

Sp. 117.—Rock Dove, { Columba livia. *(Brisson.)*
Bisset Pigeon.

Rare; I am informed by Mr. T. E. Gosling, that this bird is found in a wild state on the south coast of Devon; and *Polwhele* * states that it exists on the north coast, near Combe Martin, and at Lundy island. This is the true progenitor of our Domestic Pigeons; it is distinguished from the former by this circumstance, as well as by being white on the rump, (old

* History of Devonshire, vol. i.

and young;) the former were ash-coloured on that part. In the domestic state it is common.

Sp. 118.—Turtle Dove, or Common Turtle, { Columba turtur. *(Lin.)*

Rare; visits us sometimes in summer only; a specimen was shot on Estover lawn, in June, 1829, by R. Julian, esq. Others are in Mr. Comyns', in Mr. Drew's, and Mr. Rowe's collections.

Order 5.—THE WADERS.

Fam. 1.—Brevipennes.

Fam. 2.—Pressirostres.

Gen.—THE BUSTARDS.

Sp. 119.—Great Bustard.—Otis tarda. *(Lin.)*

Now become very scarce; *Montagu* states that a specimen was shot near Plymouth in the winter of 1798, and two others, the following year; in 1804 another was taken to Plymouth market.

Sp. 120.—Little Bustard, { Otis tetrax. *(Lin.)* Tetrax campestris. *(Leach.)*

Very rare; *Montagu* speaks of one shot in December, 1804, and taken to Plymouth market, where it was sold as a Heath Fowl. He saw one in a turnip field in October, 1810, in Devonshire.

Gen.—THE PLOVERS.

Subg.—(The Thick-knees.)

Sp. 121.—Common Thick-knee, Thick-kneed Bustard, Norfolk Plover. { Œdicnemus crepitans. *Tem.* Charadrius œdicnemus. *(Lin.)*

Rather uncommon; arrives here in spring, and leaves us in October. *Montagu* says, it is not frequent so far westward as Devonshire; but in the mild winter of 1807, two were shot near the Start, in February; and in the winter of 1826, one was shot near Plymouth, and is now in Drew's collection; one is at Mr. Rowe's, and another in the collection at Ham.

Subg.—(The True Plovers.)

Sp. 122.—Golden Plover.—Charadrius pluvialis. *(Lin.)*

Common; remains with us all the year. A brood of six was obtained on the banks of the Tamar, in 1827; and two young were found on Roborough down, in 1829, and are now in possession of Mr. J. Whipple, of Plymouth. Great numbers are sold in Plymouth market, in winter. E. M.

Sp. 123.—The Dottrel, or Little Plover, { Charadrius morinellus. *(Lin.)*

Rare; frequents the moors in April and June, aud again in September and November, but it is not known if it breeds in this district. Several were seen on Dartmoor in September, 1828, by the Rev. S. Rowe; a specimen is in Mr. J. B. Rowe's possession.

Sp. 124.—Ringed Plover, Ring Dottrel, or Sea Lark. { Charadrius hiaticula. *(Lin.)*

Common; frequent our coasts all the year, but are much more numerous in winter on the sands at the mouths of the rivers. In July, 1828, I shot several young birds, in company with the Purres, on the Plymouth Breakwater. E. M.

Gen.—THE LAPWINGS.

Subg.—(The Lapwing Plovers.)

Sp. 125.—Grey Squatarolle, Swiss Sandpiper, or Grey Plover. { Squatarola grisea. *(Steph.)* Tringa squatarola. *(Lin.)*

Rare: found in winter, and departs early in the spring. Specimens at Drew's. E. M.

Subg.—(True Lapwings.)

Sp. 126.—Crested Lapwing, or Peewit. { Vanellus gavia. *(Steph.)* Tringa vanellus. *(Lin.)*

Common all the year; congregates in winter, when great numbers are sent to the Plymouth market. E. M.

Gen.—THE OYSTER-CATCHERS.

Sp. 127.—THE OYSTER-CATCHER, or Sea-Pie { Hæmatopus estralegus. *L.*

Not uncommon near the sea shores in small flocks, in winter. I possess one with a white ring on the neck; Mr. Comyns and Mr. Drew have specimens. E. M.

Fam. 3.—CULTRIROSTRES.

TRIBE 1.—*CRANES.*

Sp. 128.—COMMON CRANE, { Grus cinerea. (*Bechstein.*) Ardea grus. (*Lin.*)

Very rare; formerly Cranes abounded in this country. Ray in his Synopsis, p. 95, says, "In palustribus Lincolniensibus, et Cantabrigiensibus magni horum greges, hyberno tempore inveniuntur." But for the last sixty years, only four specimens have been procured, the most recent of which was a fine male, shot in the parish of Buckland Monachorum, near Plymouth, in September, 1826, which is now preserved in Drew's collection.

TRIBE 2.—*HERONS.*

Sp. 129.—COMMON HERON.—Ardea cinerea. (*Lin.*)

Herons were formerly very numerous, and are still preserved in this county in Heronries at Sharpham, on the Dart, and also at Warleigh, near Plymouth, the seat of the Rev. Walter Radcliffe, to whom I am indebted for a specimen. E. M.

Sp. 130.—CRESTED PURPLE HERON, } Ardea purpurea. *Gm.*
Rufous Heron, ——— rufus. (*Lath.*)
Greater Bittern, ——— Botaurus. (*Gm.*)
African Heron, ——— Africana. (*Lath.*)
Purple Heron, ——— purpurata. (*Gm.*)

The latter named birds are all different states of the Purple Heron, (*Cuvier;*) it is very rare, only four or five have been killed in England. The Ardea Caspica, variegata, and Africana, are, according to *Temminck*, the young of this bird, in which plumage it was seen on the banks of the Plym, in April, 1824, by Mr. T. E. Gosling, of Leigham.

Sp. 131.—LITTLE HERON, ——— Bittern, Rufous Bittern, or Rayed Bittern, } Ardea minuta. (*Lin.*) Botaurus rufus. (*Brisson.*)

Very rare; three of these birds, a female and two males, were shot in Devonshire, in 1808, near Crediton, two of which are in the collection of Mr. Comyns. The Rufous and Rayed Bittern of *Latham* are the young. *Temminck.*

Sp. 132.—FRECKLED HERON.—Ardea lentiginosa. (*Mon.*)

A drawing of this bird is given by *Montagu*, in the Supplement to the Ornithological Dictionary; it was shot in 1804. A specimen exactly corresponding to his description was shot at Mothecombe, near Plymouth, December 22nd, 1829, and psesented to me by John Nichols Hawker, esq. of Rock; it is smaller than the Common Bittern, but does not answer the description of the Little Heron; I suspect it to be the young of the Common Bittern. E. M.

Sp. 133.—GREAT WHITE HERON, or Great Egret, } Ardea alba. (*Gm.*) ——— egretta. (*Gm.*)

The A. alba is, according to *Temminck*, the young of the A. egretta. One of this species was seen on the banks of the Avon, in the south of Devon, in company with several of the common species, by the Rev. Mr. Vaughan. (See Montagu Orn. Dict. Sup.)

Sp. 134.—LITTLE WHITE HERON, or Red-billed Heron. } Ardea æquinoctialis. *Lat.*

This bird is marked by *Cuvier* as the young of the A. cerulea. A specimen was shot near Kingsbridge, in October, 1805, which was described by *Montagu*, and is now in the British Museum, where it was examined by *Temminck*, who acknowledges it to be the Little White Heron, but does not doubt that it had escaped from some menagerie, as it is not understood to be even a European bird. (Manuel d'Ornithologie, ed. 2, p. 565.)

Subg.—(The Bitterns.)

Sp. 135.—Great Bittern.—Ardea stellaris. (*Lin.*)

Rather uncommon in England; it has been shot at Warleigh, and in January, 1829, several were obtained on the river Tamar. A specimen in Mr. Rowe's, and in Drew's collection. Mr. Comyns has two, procured on the Exe in May. On the 17th of December, 1829, a fine specimen alighted on the roadside, as a butcher's boy was riding along a lane near Newnham, the seat of G. Strode, esq. which he struck down with a whip, and it is now in my possession; the stomach contained a trout. E. M.

Sp. 136.—Night Heron, or Gardenian Heron, { Ardea nycticorax. —— gardeni. (*Gm.*) —— maculata. (*Frisch.*) }

Both *Cuvier* and *Temminck* state the Gardenian to be the young of the A. nycticorax, or Night Heron. Mr. Gosling informs me, that a specimen was some time since shot at Leigham.

Subg.—(The Spoonbills.)

Sp. 137.—The White Spoonbill.—Platalea leucerodea. Gm.

Rare; *Montagu* says it has been seen on our coasts in winter, and that two were shot near Kingsbridge, Nov. 1804, and March, 1807, which were then in his collection: they were in company with the Common Heron. A specimen in possession of C. Tripe, esq. Devonport, was shot on the Tamar; the old birds have a flowing crest. Mr. Comyns has one, shot on the Exe.

Fam. 4.—Longirostres.

Gen.—THE WOODCOCKS.

Subg.—(The Ibis.)—*Cuv.*

Sp. 138.—Bay Ibis, Glossy Ibis, Green Ibis, { Ibis ignea. (*Stephens.*) Ibis falcinellus. (*Tem.*) Tantalus falcinellus. (*Lin.*)

Rare; *Montagu* conjectured the T. falcinellus of *Linneus* to be the state of perfect plumage; the T. igneus, or Glossy Ibis, to be the state advancing to maturity; and the T. viridis, or Green Ibis, to be the young—this idea is confirmed by *Temminck*, with regard to the latter, which he also considers the young bird. Three Devonshire specimens are mentioned by *Montagu*—one shot near Ivybridge, in September, 1805; another in October, 1809; and the third in 1805, is in Mr Comyns' collection. The Rev. Mr. Radcliffe informs me, that one was shot near Warleigh, some years ago, and sent to the British Museum—a specimen shot on the Exe, is in Mr. Comyns' collection.

Subg.—(True Curlews.)

Sp. 139.—The Common Curlew, { Numenius major. *Steph.* Scolopax arquata. (*Lin.*)

Common all the year at the mouths of our rivers; often sold in the markets. E. M.

Sp. 140.—Whimbrel, { Numenius phæopus. (*Latham.*) Scolopax phæopus. (*Lin.*)

Not so common as the former; visits us in small flocks in winter—a specimen in Drew's collection.

Subg.—(True Woodcocks.)

Sp. 141.—Woodcock.—Scolopax rusticola. (*Lin.*)

Common; arrive in October and November, according to the mildness of the season; they are sold in the markets in great numbers; they occasionally remain all the year, and breed on the moors, of which *Montagu* mentions some instances. They are sometimes met with of a cream-coloured mottled hue, of which one was presented to *Montagu* by Mr. Bulteel, of Fleet; another was purchased in Exeter market, by Mr. Comyns, who has also a white variety, shot by the Hon. Newton Fellowes, at Exmouth. E. M.

Sp. 142.—The Snipe.—Scolopax Gallinago. (*Lin.*)

Common, usually in winter; but some of them breed here, as I saw a brace feeding among the sea weed in June, 1829; and Mr. Gosling possesses some eggs, procured in the neighbourhood of Leigham. E. M.

Sp. 143.—The Great Snipe.—Scolopax major. (*Lin.*)

Rare; has been observed in the south of Devon. (See Mont. Orn. Dict. sup.)

Sp. 144.—Jack Snipe, or Judcock. { Scollopax Gallinula. (*Gm*). Gallinago minima. (*Stephens.*) }

Common in winter. E. M.

Sp. 145.—Brown Snipe, Red-breasted Snipe, or Brown Long-beak. { Scolopax grisea. (*Gm.*) Macroramphus griseus. (*Leach.*) }

Montagu describes a bird under the first name shot on the coast of Devon, in October; the Scolopax Noveboracensis, or Red-breasted Snipe of *Pennant*, (Arctic Zoology,) is the same bird in its spring plumage, according to *Temminck*, who also states that the Red-breasted Snipe of *Montagu*, (Orn. Dict. sup.) is a Limosa Rufa, or Red Godwit, in its spring plumage. (See Fedoa pectoralis, in Shaw's Zoology.)

Subg.—(The Godwits.)

Sp. 146.—Red Godwit, Grey Godwit, Common Godwit, } *Young.* { Limosa rufa. (*Brisson.*) Scolopax lapponica (*Gm.*) leucophæa. (*La.*) Fedoa rufa. (*Steph.*) }

Much confusion has arisen regarding this and the following bird; in its winter plumage this is the Common Godwit of

Pennant, (B. Z.) and towards spring the old male changes the plumage of the neck and breast from ash-colour to deep red, when it is the L. Rufa of *Brisson*, and Red Godwit of *Buffon*, *Bewick*, *Temminck*, and *Stephens*. (Shaw's Zoo.) It is occasionally found here; Drew possesses a specimen in winter, and one in summer plumage; a specimen shot near Sidmouth, October, 1828, is in Mr. Comyns' collection; a brood of seven was seen on the Tamar, in June, 1828, and four shot. The Red-breasted Snipe of *Montagu* is this bird in its spring plumage, (*Temminck*, p. 681.)

Sp. 147.—Black-tailed Godwit { Limosa melanura (*Liesler*.)
Lesser Godwit, — Scolopax ægocephala et belgica. *L.*
Jadreka Snipe, — ——— limosa. (*Lin*.)

May be easily distinguished by its tail being always black; the old bird, in winter plumage, is the Jadreka Snipe of *Latham*; in its spring plumage, it is the Red Godwit of *Latham*, *Pennant*, and *Montagu*—a specimen is in Drew's collection; and another, shot on the Warren in 1829, in that of Mr. Comyns.

Subg.—(The Sandpipers or Knots.)

Sp. 148.—Ash-coloured Sandpiper } Calidris islandica. *St.*
or Knot-Sandpiper. — Tringa cinerea, canutus et grisea. (*Gm*.)

The Knot of *Latham* and *Pennant*, (Brit. Zoo. p. 124,) is the old bird in winter plumage; the Dusky, Freckled, Southern, and Aberdeen Sand-pipers, are different names for the young birds after the first moult. Two of these birds in the plumage of the young, were shot on the Tamar, in August, 1828, of which I possess one. E. M.

Sp. 149.—Purple Sandpiper } Calidris islandica. (*Cuv.*)
Sea Sandpiper, — Tringa maritima. (*Brunnick*.)
Selninger Sandpiper, — ——— nigricans. (*Mont*.)

Rare; the young of the first year is the Knot of *Pennant*, (Brit. Zoo. p. 123.) Drew has specimens shot on the Tamar.

Sp. 150—LITTLE STINT, Little Sandpiper, Least Snipe, or Brown Sandpiper. { Calidris ——— (*Cuv.*) Tringa Temminckii. (*Leisler.*) ——— pusilla. *Bechstein.*

This bird has been confounded with the Tringa minuta, or Little Dunlin; it is distinguished from that bird by the bill being slightly curved at the point, (only seen in a fresh state,) and being brown, instead of black; tail pointed or cuneiform, in the other doubly forked; tarsus eight lines long, in the other ten lines. On comparing the descriptions in *Temminck* and *Montagu*, I have no doubt also but that the T. Temminckii and T. pusilla are the same;—several specimens have been obtained in the south of Devon, one is mentioned by *Montagu*. Others are in possession of Mr. Tripe and Drew; they have been seen in small flocks of five or six on the Lary, near Plymouth, in October.

Subg.—(The Sanderlings.)

Sp. 151.—SANDERLING, Curwillet, or Ruddy Plover. { Arenaria calidris. (*Meyer.*) Calidris arenaria.—*Illiger.* Charadrius calidris.—*Lin.*

This bird is distinguished from the Sand-pipers by wanting the hind toe; it is said to be common on the coasts of England in spring and autumn, flocking with the Purres, but with us it is very rare; one specimen in possession of Mr. Comyns, was shot near Exmouth, in the spring of 1829.

Sp. 152.—THE PURRE, Dunlin, or Red-backed Sandpiper, { Pelidna variabilis.—*Steph.* Tringa variabilis.—*Tem.* ——— cinclus.—*Lin.*

The identity of the Purre and Dunlin was first established by Montagu; the latter is the Purre, in its summer plumage. Great numbers of them appear in the mouths of our rivers, about August, and remain through the winter. Prodigious flocks of them roost on the Breakwater, Plymouth, during the night; some few remain the summer, and breed here. They are termed Sanderlings by the common people, but the true Sanderling is much rarer. E. M.

Sp. 153.—The Cape Curlew, Red Sandpiper,—*Penn.* Pygmy Curlew.—*Bechs.* { Pelidna subarçuata. (*Cuv.*) Tringa ——— *Tem.* Nemenius Africanus. *Lath.* ——— pygmeus. *Bechs.*

The Cape Curlew of *Latham* is the Pygmy Curlew of *Bechstein;* it is described by *Montagu,* (Orn. Dict. sup.) under the latter name, but the true Pygmy Curlew of *Latham* is the young of the Tringa platyrhyncha of *Temminck*, and not the Falcinellus of *Cuvier*, which is a different bird, and wants the hind toe. Mr. Rowe has a bird corresponding to *Montagu's* description, and which agrees with the Tringa subarçuata of of *Temminck*. Another is in Drew's collection, who has also the Red Sand-piper of *Pennant*, which is the same bird, in its spring plumage.

Sub.—(The Combatants.)

Sp. 154.—Fighting Ruff, Reeve (female) { Machetes pugnax.—*Steph.* Tringa pugnax.—*Lin.*

The old males acquire a ruff of long feathers about the neck in the breeding season, which falls off towards the end of June. The female is destitute of a ruff; they are scarce in Devon; *Montagu* had a specimen from Exeter: they depart in autumn, though one was shot on Slapton Lay, 27th December, 1808. One with a white ruff was shot on the Avon, May 17th, 1806—other Devon specimens are in possession of Mr. Comyns, Mr. Rowe, and Mr. Drew. The Shore Sand-piper is the young bird—the Greenwich Sand-piper, and Yellow-legged Sand-piper are varieties—the Equestrian Sand-piper is the female in winter plumage.

Subg.—(The Phalaropes.)

Sp. 155.—Grey Phalarope, Grey coot-footed Tringa, Red Phalarope. { Phalaropus griseus. *Steph.* Tringa lobata.—*Lin.* Phalaropus platyrhinchus.—*Tem.*

This bird is rare in Europe, but we have some specimens—one in Mr. Rowe's, and one in Mr. Drew's collection. After a hard south-west wind on the 6th, 7th, and 8th October, 1828, a specimen was shot on St. John's lake, on the Tamar; another was seen in Sandycove bay; and a third was shot on the Exe, about the same time. The Grey P. of *Latham* and *Pennant* is the young; the Red P. of *Latham* is the spring plumage, (*Temminck;*) the true Red Phalarope (Lobipes of *Cuvier,*) has not been found in Devon.

Subg.—(The Turnstones.)

Sp. 156.—TURNSTONE, Sea Dotterel, Hebridal Sandpiper, { Strepsilas interpres. (*Steph.*) Tringa interpres. (*Lin.*)

Visits us in August, in its passage south; I saw a brood on the Breakwater, in August, and shot the male and one young; specimens also are found in the collections of Mr. Rowe and Mr. Drew. E. M.

Subg.—(The Horsemen.)

Sp. 157.—GREENSHANK, Green-legged Horseman, Cinereous Godwit, { Totanus glottis. (*Bechstein.*) Scolopax glottis. (*Lin.*)

The Greenshank of *Pennant* is the young; in this state it visits us sparingly in winter; specimens belong to Mr. Rowe and Mr. Drew.

Sp. 158.—SPOTTED REDSHANK, Dusky Sandpiper, Cambridge Godwit, Spotted Snipe. { Totanus fuscus. (*Leisler.*) Scolopax fusca. (*Lin.*)

Rare; two have been shot in Devonshire, (Montagu.) The Cambridge Godwit and Courland Snipe are the young, says *Cuvier*, p. 530; but *Temminck*, who has shot more than fifty, declares them to be this bird in winter plumage; the spotted Snipe of *Latham* to be the young; and the Tringa atra of *Gmelin*, Dusky Snipe and Black-headed Snipe of *Latham*, to be the spring dress.

Sp. 159.—REDSHANK, Poolsnipe, or Gambet Sandpiper. { Totanus calidris. *Bechs.* Tringa gambetta.—*Lin.*

Not uncommon on our shores in winter, but probably breeds here, as I have a specimen, sent in June, 1828, shot on the

Warren, by Mr. Tucker, of Mount Pleasant; another in Drew's collection. The Striated Sand-piper of *Latham*, is the young in moult; the Gambet Sandpiper, or Redshank, is the same in summer plumage. (*Temminck.*) E. M.

Sp. 160.—GREEN SANDPIPER, Wood Sandpiper. (*Lin.* T. v. i.) — Totanus ochropus. *Tem.* Tringa ochropus.—*Lin.*

Rare; is a winter bird; considered by *Latham* to the same as the T. glareola, or true Wood Sand-piper of *Linneus*, but disproved by *Montagu*, in which opinion he is followed by *Temminck*, p. 653; he speaks of one shot in Devon, in August. A specimen is in Drew's collection. E. M.

Sp. 161.—LONG-LEGGED SANDPIPER, Wood Sandpiper.—(*Mont.*) — Totanus ——— *Cuv.* Tringa grallatoris.—*Mont.*

Very rare; this bird was considered unknown in England, until a specimen shot in August, in Devonshire, was obtained by *Montagu*. (Orn. Dict. Sup.)

Sp. 162.—COMMON SANDPIPER, — Totanus hypoleucos. *Tem.* Tringa hypoleucos.—(*Lin.*)

Common: visits us in spring, and departs in autumn; frequents the rivers, and sometimes dives when wounded. Mr. Rowe's and Drew's collection. E. M.

Subg.—(The True Waders.)

Sp. 163.—BLACK-WINGED LONGSHANKS, Long-legged Plover. — Himantopus melanopterus. (*Mey.*) Charadrius himantopus. *L.*

Very rare; Mr. Comyns has one shot in Devon, and Mr. Gosling informs me that a specimen was shot on Slapton Lay.

Gen.—THE AVOCETTES.

Sp. 164.—THE AVOCET.—Recurvirostra avocetta. (*Lin.*)

These birds frequent the mouths of rivers in winter; they have been often seen on the Exe, from which Mr. Comyns obtained two specimens; one in possession of Mr. Tripe, was shot on the Tamar.

Fam. 5.—Macrodactyles.

Gen.—THE RAILS.

Sp. 165.—Water-rail, or Brook Ouzel. } Rallus aquaticus. (*Lin.*)

Rather common all the year, particularly in autumn and winter, when they are brought to market; specimens in my possession, and in Drew's collection. They are said to be migratory on the continent. E. M.

Sp. 166.—Land-rail, 'Corn Crake, or Crake Gallinule. { Rallus crex. (*Gmel.*) Ortygometra crex. (*Steph.*)

Common; appears in April, and departs in October; sold in the markets. E. M.

Sp. 167.—Spotted Crake, Spotted Gallinule, Water Crake. { Rallus porzana. (*Lin.*) Ortygometra porzana. (*Stephens.*)

Rare; obtained as early as the 14th March, and as late as the 23rd October, in Devonshire, but never in winter months, (Montagu, Sup.) Two specimens in Mr. Gosling's, and three in Drew's collection.

Sp. 168.—Little Craker, Little Gallinulé, Dwarf Rail { Rallus pusillus. (*Gmelin.*) Zapornia minuta. (*Leach.*)

Very rare; only one specimen known, and that obtained by *Dr. Tucker*, near Ashburton, 1809. (See Montagu Orn. Dict. Supplement.)

Sp. 169.—Olivaceous Gallinule Olivaceous Crake. } Gallinula Foljambii. *M.* Ortygometra olivacea. *Steph.*

I do not observe that *Cuvier* has mentioned this bird; it was first described by *Montagu*, from a specimen in the collection of Mr. Foljambe; another was obtained by Mr. Plastead, on the Thames, 1812; and a third is now in possession of Mr. Drew, which was discovered fluttering against a house in the town of Devonport, and was caught by some boys, 13th May, 1829.

Gen.—THE COOTS OR MOOR-HENS.

Subg.—(The Gallinules.)

Sp. 170.—Common Gallinule, Water Hen, or Moor Hen. { Gallinula chloropus. *Lath.* Fulica chloropus. *(Lin.)*

Common all the year, frequently brought to market in winter. E. M.

Subg.—(True Coots.)

Sp. 171.—Common Coot, Greater Coot. { Fulica atra. *(Lin.)*

Common all the year, sold in the markets in winter. E. M.

Order 6.—WEB-FOOTED BIRDS.

Fam. 1.—Brachypteres.

Gen.—DIVERS.

Subg.—(The Grebes.)

Sp. 172.—Crested Grebe, Tippet Grebe. { Podiceps cristatus. *(Latham)* Colymbus cristatus. *(Lin.)*

Not uncommon about the shores and rivers; one old bird, and one young, were seen at the mouth of the Exe, in May, 1829. Mr. Comyns possesses two specimens, male and female; and two are in Drew's collection. The Tippet Grebe is the young, according to *Temminck*. E. M.

Sp. 173.—Horned Grebe, Sclavonian Grebe, Dusky Grebe. { Podiceps cornutus. *(Lath.)* Colymbus cornutus. *(Lin.)* Podiceps obscurus.

The P. obscurus, or Dusky, is the young bird, and in this state "is by no means uncommon in Devonshire," says *Montagu*. The Eared Grebe of *Latham*, var. A, is this bird at two years old, according to *Temminck*—specimens in the collections of Mr. Comyns, Mr. Rowe, and Mr. Drew.

Sp. 174.—RED-NECKED GREBE, { Podiceps rubricollis. *Lath.*
Colymbus subcristatus. *Gm.*
——— parotis. *Gm.* }

Rare; *Latham*, in his supplement, speaks of one shot at Teignmouth, in January; four were killed at Slapton Lay, in February, 1809, according to *Montagu*. One is in Drew's collection, shot in June.

Sp. 175.—LITTLE GREBE, Black-chined Grebe, or Dobchick. { Podiceps minor. *(Lin.)* }

Common all the year about the rivers; a specimen with the whole of the abdomen tinged a light crimson colour, was obtained by Pincombe, of Devonport, in December, 1829. E. M.

Subg.—(True Divers.)

Sp. 176.—NORTHERN DIVER, Imber Diver. { Colymbus glacialis. *(Latham.)*
——— immer. *(Lin.)* }

The Imber is now considered to be the young of the Great Northern Diver. Montagu states that both of them are scarce in the south of Devon. In the mature plumage, I have only heard of one specimen which was shot on the Exe, in May, 1829: but in the state in which it is called the Imber, it is not unfrequent. In December, 1828, a flock of seven was seen on the Tamar, near Saltash, and one shot, which is in my possession: another shot ou the Plym, December, 1829, is in my collection—others are found in the collections of Dr. Magrath, Mr. Rowe, and Mr. Drew. E. M.

Sp. 177.—RED-THROATED DIVER, Speckled Diver. Striped Diver. { Colymbus septentrionalis. *L.*
——— stellatus.—*(Gm.)*
——— striatus.—*(Gm.)* }

Rare; said to be by no means uncommon in the southern coasts in severe winters, (*Montagu.*) Drew possesses a specimen, shot in August; the Speckled and Striped Divers are now considered to be the young; if so, these are (under the name of Loon,) frequently found on our coasts in winter; Drew has one. E. M.

Subg.—(The Guillemots.)

Sp. 178.—FOOLISH GUILLEMOT, Murre. { Uria troile.—*(Latham.)* Colymbus troile.—(*Lin.*)

This bird is considered by *Cuvier* and *Temminck* to be the same as the Lesser Guillemot in its spring plumage, but as *Montagu* has given some good reasons for considering them distinct, (See Orn. Dict. Sup.) I shall adhere to the old arrangement. The Foolish Guillemot frequents our coasts during the summer, where it breeds, and generally leaves us for a more southern climate, about August, though a few instances have occurred of its being obtained in the winter. I have a specimen shot here February 20th, 1830; specimens in the collections of Mr. Comyns, Mr. Rowe, and Drew. E. M.

Sp. 179.—LESSER GUILLEMOT, { Uria minor.—*(Latham.)* Colymbus minor.—*(Lin.)*

These birds appear on our coasts in winter, and as they are not known to breed here, *Montagu* supposes they emigrate from the north at that season; *Temminck*, however, states that this is the winter plumage of the former, but *Montagu*, in opposition to that declares that the Foolish Guillemot does not change its plumage, as it has been shot in Devon in January, with the markings of the bird as described in summer; and I can corroborate that fact from a bird in my possession, shot February 20th; specimens in every collection. E. M.

Sp. 180.—BLACK GUILLEMOT, Greenland Dove. Spotted Guillemot. { Uria grylle.—*(Latham.)* Colymbus grylle.—(*Lin.*)

Rare; the Spotted Guillemot is the young bird, and in that state a specimen is in Drew's collection.

Subg.—(The Greenland Doves.)

Sp. 181.—COMMON SEA DOVE, Little Auk. { Cephus alle.—(*Cuv.*) Mergulus melanoleucos.—*Stephens.* Alca alle.—*(Lin.)*

Very rare; two of these birds have been found far inland in the south of Devon, one dead, and the other alive. (Vide Orn. Dict. Sup.)

Gen.—THE PENGUINS.

Subg.—(The Puffins.)

Sp. 182.—Puffin, or Sea Parrot, { Fratercula arctica.—*(Steph.)* Mormon fratercula.—*(Tem.)* Alca arctica.—*(Lin.)*

Very rare in the south of Devon, though numbers build on the north coast at Lundy island; they are occasionally met with however in mild winters; one was brought to *Montagu* in February, 1811, another is in Mr. Comyns' collection.

Subg.—(True Penguins.)

Sp. 183.—Razor-billed Auk, or Murre. { Alca tordà.——*(Lin.)* Utamania torda.—*(Lin.)*

Cuvier considers this synonymous with Alca pica, as well as *Temminck;* but *Montagu* esteems them distinct, (Vide Orn. Dict. Sup.) It appears mostly on our coasts in summer, but I have seen one shot 20th February; Mr. Whipple and Drew have specimens. E. M.

Sp. 184.—Black-billed Auk, White-throated Razor-bill. { Alca pica.—*(Lin.)* Utamania pica.—*(Step.)*

Temminck declares this to be the young of the former—*Leach* and *Stephens* follow *Montagu* in holding them distinct. These birds appear on our coasts in winter only. *(Montagu.)* Several are in Drew's collection. E. M.

Fam. 2.—Longipennes.

Gen.—THE PETRELS.

Subg.—(True Petrels.)

Sp. 185.—Stormy Petrel.—Procellaria pelagica.

Montagu states this bird to be scarce here, but some of them are frequently caught in winter in Plymouth harbour, by flying against the lanterns of the Breakwater light vessel, of which I possess two; they have been known to breed in Cornwall. E. M.

Sp. 186.—Leach's Petrel.—Procellaria Leachii. *(Tem.)*

A rare bird, first discovered by *Dr. Leach*; one was killed in Devonshire, in December, 1823. (Shaw's Zoology.)

Subg.—(The Shearwaters.)

Sp. 187.—SHEARWATER PETREL, or Mank's Puffin. { Puffinus anglorum. *Steph.* Procellaria anglorum.—*Tem.*

Rare; is known to breed in Lundy island, on the north coast of Devon, and some specimens have been obtained in Plymouth sound. (Drew.)

Gen.—THE GULLS.

Subg.—(True Gulls.)

Sp. 188.—GREAT BLACK-BACKED GULL, Wagel Gull. { Larus marinus. *Lin.* Larus nævius. *Gm.*

Rather rare; legs flesh-coloured; occasionally obtained in Plymouth sound; a specimen in Drew's collection of the young, and a fine full grown male, shot near the Mewstone, January, 1830, is in my possession. E. M.

Sp. 189.—SILVERY GULL, Herring Gull { Larus argentatus. *(Brunnich.)* Larus fuscus. *(Gm.)*

Common all the year; these birds breed along our coasts, particularly at Wembury cliffs, near Plymouth; the young does not acquire the full plumage till the autumn of the third year, and is at first mottled, and so much like the young of the Lesser Black-backed Gull, as to be only distinguished by the length of the tarsus. The Herring Gull is the summer plumage; specimens in Drew's collection. E. M.

Subg.—(The Mews.)

Sp. 190.—LESSER BLACK-BACKED GULL.—Larus fuscus. *Lin.*

Has been confounded with the L. marinus, but is only half its size and weight; legs yellow; it is occasionally seen in Plymouth sound; a specimen in Drew's collection.

Sp. 191.—COMMON GULL, Winter Mew. { Larus cyanorhynchus. *(Meyer.)* Larus canus. *(Lin.)*

Common on our shores all the year, (*Montagu,*) a specimen in Drew's collection; the Winter Mew, or Coddy Moddy, is the young bird. E. M.

Sp. 192,—Black-headed Gull, Red-legged Gull, Brown Gull, or Tern. { Larus ridibundus. *Leisler.* ——— erythropus.—*(Gm.)* Sterna obscura.—*(Lath.)*

This bird has in consequence of its change of plumage, been multiplied into five or six species; but *Montagu* has ascertained that all the changes refer to one species, and are effected in one year; in the nestling feathers it is the Brown Tern of *Ray;* in the second change it is the Brown Gull of *Latham;* third, in autumn, it is the Brown-headed Gull, (L. erythropus; fourth, in winter, Red-legged Gull, (L. cinerarius;) and fifth, it is the Black-headed Gull, (L. ridibundus,) in the perfect spring plumage. In its winter plumage it is not uncommon with us; specimens are in my own and Drew's collection, but in its spring plumage it is very rare. *Montagu* speaks of having seen it as late as July, in the south of Devon. E. M.

Sp. 193.—Kittiwake Gull, Tarrock Gull. { Larus tridactylus.—*(Lin.)* ——— rissa.—*(Lin.)* Rissa Brunnichii.—*(Leach.)*

Montagu says this bird is scarce on our coasts, but I have frequently seen them in Plymouth sound, where I shot one in July, 1829, now in my possession. The Tarrock is the young before the second autumnal moult; these frequently visit us. I obtained two in the Sound, in November, 1828, and two in August, 1829, now in my possession. The name is doubtless derived from the cry of the bird, which it utters at its breeding place, when alarmed, pronouncing the word "Kittiwake" quite distinctly, as I have experienced at the Bass island. E. M.

Sp. 194.—Little Gull.—Larus minutus.—*(Lin.)*

Very rare; the only British specimens known are three; the first shot at the Thames, near Chelsea, was described by *Montagu*, (Orn. Dict. Sup. Index;) another was shot at Brent, in the south of Devon, by Mr. C. Prideaux, and is now in the British Museum; the third was shot September 28th, 1828, by J. Whipple, esq. surgeon, of Plymouth, twenty miles up the Tamar, and is now in that gentleman's possession. It corresponds exactly with the drawing and description in *Montagu's* work; and is evidently a young bird of the first year, from the bar at the tail, and the pale flesh-coloured legs; *Temminck* states that in the winter plumage it has vivid red legs, and in the summer has a black head, neither of which is the case in Mr. Whipple's specimen. It is remarkable that all these birds have been found far up the rivers; it must argue a great want of Ornithological knowledge to confound this bird with the young Kittiwake.

Subg.—(The Jagers.)

Sp. 195.—Arctic Gull, Blacktoed Gull, { Lestris parasiticus.—*(Tem.)* Larus crepidatus.—*(Lin.)* Stercorarius cepphus.—*(Step.)* }

The Black-toed Gull is now determined to be the young of the Arctic; in that state it has been procured here. Drew possesses one specimen; and after a severe south-west gale, in September, 1828, two others were obtained. One was shot in a field, by the gamekeeper of J. Tonkin, esq. which is now in possession of R. Julian, esq.; and on October 9th, 1828, another was caught in Catwater harbour, Plymouth, in an exhausted state, by a water spaniel, which is now in my possession. It exactly corresponds with the figure and description of *Bewick;* and is a young bird of the first year, according to *Temminck's* description, except that the two central tail feathers project about an inch, whereas he says, "queue seulement arrondie," p. 798. E. M.

Sp. 196.—Skua Gull.—Lestris catarractes.

Very rare; a specimen was obtained here by Mr. Drew, in February, 1830, and is now in his collection.

Gen.—THE TERNS.

Sp. 197.—Common Tern.—Sterna hirundo.—*Lin.*

Frequents our coasts; specimens of old birds in Mr. Rowe's and Mr. Drew's collection. In October, 1828, a strong gale brought in great numbers of the young birds, which frequented the shores of the harbour for two or three days; many of them were very weak, and some were picked up starved, of which I possess a specimen. E. M.

Sp. 198.—LESSER TERN, or Hooded Tern. } Sterna minuta.—*(Lin.)*

Rare; two specimens in Mr. Drew's collection, shot in the Sound.

Sp. 199.—SANDWICH TERN, African Tern, Striated Tern (Young) { Sterna cantiaca.—*(Gm.)* ——— Africana.—*(Lin.)* ——— striata.—*(Lin.)*

Rare; a pair of these birds shot in Plymouth harbour, was in possession of a man at Devonport, which I examined, after they had been sold to an itinerant collector, (1829.)

Sp. 200.—BLACK TERN, Brown Tern, Lesser Sea Swallow { Sterna nigra.—*(Gm.)* ——— fissipes.—*(Gm.)* ——— obscura.—*(Gm.)* ——— nævia.—*(Gm.)*

Although all the Terns generally leave us about the middle of October, yet *Montagu* obtained one of these in October, 1822, in Devonshire. The Brown Tern of *Latham* is the spring plumage; and the S. Nævia of *Gmelin* is the young, *(Temminck,)* of which Drew has two specimens, and Mr. Comyns one.

Fam. 3.—TOTIPALMES.

Gen.—THE PELICANS.

Subg.—(The Corvorants.)

Sp. 201.—THE CORVORANT, { Phalacrocorax carbo.—*Steph.* Pelecanus carbo.—*(Lin.)*

Common on the Shagstone, Plymouth; this species acquires a deep greenish brown crest in the spring, and has been then supposed a distinct species, but is ascertained to be the same. It is generally from three feet to three feet four inches long, and thus may be distinguished from the Crested Cormorant of *Temminck*, which is only two feet two inches long. The young are said to want a crest in winter; but I have a specimen, shot in Plymouth sound, November 10th, 1829, which corresponds with *Temminck's* description, except in having a crest of short feathers of a greenish black colour; and the eyes being light brown, with a pale green tinge.

Sp. 202.—SHAG, or Green Corvorant, { Phalacrocorax graculus.—*Steph.* Pelecanus graculus.—*(Lin.)*

Common all the year on our rivers and sea shores; specimens in my own and Drew's collection. E. M.

Subg.—(The Gannets or Boobies.)

Sp. 203.—THE GANNET, Soland Goose, or Spotted Booby (Young) { Sula alba.—*Meyer.* Pelecanus bassanus.—(*Lin.*)

This bird is frequently seen in the Channel on our coasts in the winter, as late as April; after which it retires to its breeding place, of which the most southern spot was supposed to be the isle of Bass, in the frith of Forth only, and hence the bird received the name of Pelecanus bassanus; but other places are now known, such as Ailsa crag, in the mouth of the Clyde; and I am assured by Mr. Comyns, that they have been so long accustomed to resort to Lundy island, on the north of Devon, that one spot has received the name of Gannet cove. Some of them are procured every winter in Plymouth sound, when in pursuit of shoals of fish. In January, 1829, great numbers were seen, and one person shot nine of a morning; specimens are in possession of Mr. Tripe, Drew, and myself. E. M.

Fam. 4.—LAMELLIROSTRES.

Gen.—THE DUCKS.

Sub.—(The Swans.)

Sp. 204.—WILD SWAN, or Whistling Swan, { Cygnus ferus.—*(Steph.)* Anas cygnus.—*(Lin.)*

Rare; leaves this country in summer; is sometimes met with among the flocks of Wigeon in British rivers, in hard winters; one was shot on the Tamar, which is now in possession of J. Newton, esq. of Bridestow. The severe weather of January, 1830 brought great numbers of them into Devonshire; I saw thirteen at different times in Plymouth and Devonport markets, and many were shot in the north, of which a specimen was sent me by the Rev. T. Law, of Torrington.

Subg.—(The Geese.)

Sp. 205.—WILD GOOSE, Grey-leg Goose, { Anser ferus.—(*Stephens.*) Anas anser.—*Lin.* }

This is the source from whence our domesticated Geese are produced; in their wild state they are sometimes shot here in winter. I saw specimens in Plymouth market in January, 1829, and several more in January, 1830.

Sp. 206.—BEAN GOOSE, { Anser segetum.—*Steph.* Anas segetum.—*Gm.* }

Said to be more frequent than the former in England. *Montagu* mentions two Devon specimens; many were obtained here in January, 1830, of which I have a specimen. E. M.

Sp. 207.—WHITE-FRONTED GOOSE Laughing Goose. { Anser albifrons.—*Bechs.* Anas albifrons.—*Lin.* }

Generally rare; Mr. Comyns possesses a specimen, shot on the Warren, at the mouth of the Exe. Dr. Magrath, of Plymouth, has a specimen. In January, 1830, great numbers were shot here, and the markets were crowded with them. E. M.

Subg.—(The Bernacles.)

Sp. 208.—BERNACLE, or Clakis. { Anser leucopsis.—(*Bechst.* Anas erythropus.—*Gm.* Bernicla erythropus.—*Stephens.* }

Rarely met with on the south coast, except in severe weather, (*Montagu.*) Mr. Comyns has two specimens, shot on the Warren, Exmouth.

Sp. 209.—**Brent or Brand Goose** { Anser bernicla ?
Anas bernicla.—*Gm.*
Bernicla brenta.—*Stephens.*

Sometimes obtained in the west of England, in the winter. Drew has a specimen. E. M.

Sp. 210.—**Egyptian Goose,** { Anser Ægyptiaca.—(*Cuv.*)
Egyptian Spurwing. Anas ——— (*Lin.*)
Chenalopex ——— (*Steph.*)

Very rare; Mr. Comyns has a specimen of this bird, which was shot on the Warren, near Sidmouth; but as this species is sometimes attempted to be domesticated in England, it might possibly be a strayed bird.

Subg.—(The Scoters.)

Sp. 211.—**Scoter or Black Diver** { Anas Nigra.—(*Lin.*)
Oidemia ——— *Steph.*

Rather rare; I possess a fine male specimen, shot on the Lary, near Plymouth, in January, 1829. The young male is similar to the female, but with the knob and yellow mark on the bill of this; Drew has a specimen. The female has no knob, and the bill is a dark horn-colour; specimens in possession of Drew and Mr. Whipple. E. M.

Sp. 212.—**The Great Black Duck** { Anas fusca.—(*Lin.*)
Double Scoter, or Oidemia fusca.—*Shaw.*
Velvet Duck.

Very rare; stated by *Polwhele*, in his History of Devon, to have been found in Devonshire.

Sp. 213.—**Long-tailed Duck,** { Anas glacialis.—(*Lin.*)
Swallow-tailed Shieldrake, Hareida ——— *Steph.*

Rare; one instance only occurred to *Montagu* of procuring this bird in the south of Devon. (Orn. Dict. Sup.)

Sp. 214.—**Harlequin Duck,** { Anas histrionica.—(*Lin.*)
Little Brown and White Duck, ——— minuta.—(*Lin.*)
Clangula histrionica.—*Steph.*

Very rare; only two specimens are known as British. The A. minuta is the female, of which a specimen lately shot in

Plymouth harbour, is now in possession of Mr. C. Tripe, of Devonport.

Sp. 215.—Golden Eye Garrot, Morillon (Young) { Anas clangula.—*(Lin.)* Clangula chrysophthalmos. *Steph.* Anas glaucion.—*Lin.*

Rather rare; sometimes occurs in severe winters; specimens in possession of Mr. Tripe, Mr. Rowe, and Mr. Drew. E. M.

Subg.—(The Eiders.)

Sp. 216.—Eider Duck, or Cuthbert Duck, { Anas mollissima.—*(Lin.)* Somateria mollissima.—*Steph.*

Very rare; one shot on our coast in the winter of 1807, (*Montagu*,) and a female was shot near Plymouth, January, 1830, now in Drew's collection.

Subg.—(The Pochards.)

Sp. 217.—Pochard, Poker, or Redheaded Wigeon, { Anas ferina.—(*Lin.*) Fuligula ferina.—*Steph.*

Not uncommon in winter; sold in the markets; Drew has specimens. E. M.

Sp. 218.—Scaup Duck, White-fronted Duck *(female)* { Anas marila.—(*Lin.*) Fuligula marila.—*Steph.* Anas frænata of Sparman (*female*)

Generally procured here in winter; several were obtained in January, 1829; the female only has the white forehead; specimens at Drew's. E. M.

Sp. 219.—Tufted Duck, Tufted Pochard, Lapmarck Duck, Brown Duck, { Anas fuligula.—(*Lin.*) Fuligula cristata.—*Steph.*

Frequently shot on Slapton Lay in winter; several in Plymouth market, January, 1829, of which I have one. The Lapmarck Duck of *Pennant* is the young of the first year; and the Brown Duck, that of the second year, (*Temminck.*) E. M.

Subg.—(The Shovelers.)

Sp. 220.—Shoveler, { Anas clypeata.—*Lin.*
Rhynchaspis clypeata.—*Leach.* }

Rare; a specimen in Drew's collection, from the south of Devon, and another in the collection at Ham.

Subg.—(The Shieldrakes.)

Sp. 221.—Shieldrake, or Burrow Duck, { Anas tadorna.—*Lin.*
Tadorna Bellonii.—*Steph.* }

Is said to remain all the year in Britain; breeds on Braunton burrows, in the north of Devon, and is obtained in winter in the south; specimens are in possession of Mr. Tripe, Mr. Rowe, Drew, and myself. E. M.

Sp. 222.—Pintail Duck, or Sea Pheasant, { Anas acuta.—(*Lin.*)
Dafila caudacuta.—*Steph.* }

Rather scarce; in January, 1829, great numbers were brought to our market, and supplied all collectors; specimens in the possession of Drew and myself. In the severe weather of January, 1830, when we were inundated with Wild Geese and Swans, only two of these were obtained; probably they had gone farther south. E. M.

Sp. 223.—Wild Duck, { Anas boschas.—*Lin.*
Tame Duck—(Var.) ——— domestica.—*Lin.*
Hook-billedDuck—(Var.) ——— adunca.—*Lin.* }

Common; some of them breed here. E. M.

Sp. 224.—Gadwall or Grey.—Anas strepera.—(*Lin.*)

Very rare; one specimen in Drew's collection.

Sp. 225.—Common Wigeon, Whewer or Whim. { Anas Penelope.—*Lin.*
Mareca fistularis.—*Steph.* }

Very common in winter; specimens at Drew's. E. M.

Subg.—(The Teal.)

Sp. 226.—Garganey Teal, Summer Teal, or Garganey. { Anas querquedula.—*Lin.*
——— circia.—*Lin.*
Querquedula circia.—*Steph.* }

Found sometimes in summer, and also in winter, though sparingly; the Garganey of *Latham* is the young; a specimen in the collection of Mr. Tripe, Devonport—another in that of Mr. Comyns, shot on the Exe.

Sp. 227.—COMMON TEAL, or Winter Teal, { Anas crecca.—*Lin.* Querquedula crecca.—*Steph.* }

Very common in winter; specimens in Drew's collection, and others. E. M.

Sp. 228.—MERGANSER or GOOSANDER, Dun Diver, or Sparling Fowl. { Mergus merganser. *Li.* ——— castor.—*Lin.* Merganser Raii.—*Steph.* }

Rather rare; the Dun Diver of authors is the female or young of the Merganser, and in this plumage is sometimes met with on our coasts, in winter; Drew possesses specimens of the male and female, and I have the young bird. E. M.

Sp. 229.—RED-BREASTED MERGANSER, Lesser-toothed Diver, or Black Merganser. { Mergus serrator. *Lin.* Merganser serrata—*Steph.* Mergus niger. }

Rare; the Black Merganser is the young male. The Red-breasted Merganser is sometimes found here in winter. Mr. Comyns procured one in Exeter market, in 1808—another was shot on Slapton Lay, by Mr. Holdsworth, in November of the same year—and another at Leigham, a few years since. Mr. Rowe and Drew have specimens; and there is a fine male in the collection at Ham, near Plymouth.

Sp. 230.—THE SMEW, or White Nun, Red-headed Smew, or Lough Diver. { Mergus albellus.—*(Lin.)* ——— minutus.—*Lin.* }

Not uncommon in winter; the Lough Diver, or Minute Smew is the young male of the Smew—the Red-headed S. is the female; specimens in possession of Mr. T. E. Gosling, Mr. Drew, and Mr. Comyns, who has both male and female, shot on the Warren, at Exmouth.

During the progress of the above catalogue through the press, I have discovered that two other specimens may be added to it.

Subg.—(The Jer-falcons.)

Sp. THE JER-FALCON, Iceland Falcon, or Sacre. { Hiero-falco.—*(Cuv.)* Falco islandicus.—*(Lath.)* —— Gyr-falco.—*(Gm.)* }

On the authority of Polwhele, I add this to the Devon birds—It should be placed after sp. 4. The Kestrel.

TRIBE 3.—*STORKS.*

Sp. THE WHITE STORK.—Ciconia alba.—*(Brisson.)*

Very rare; three of these birds have, at different times, within the last ten years, been obtained on Slapton Lay, near Kingsbridge. (T. E. Gosling, esq.)—It should be placed after sp. 136, The Night Heron.

I have throughout the preceding pages adhered to the specific names of *Cuvier*, but as he does not give any trivial names, I have in many instances selected them from the continuation of *Shaw's Zoology* by *Mr. James F. Stephens.* I am not conscious of having cited any specimen which has not some authority for its being a Devon bird; and the entire number (232) will be found greatly to exceed those of Sussex (175,) enumerated by *Mr. Marckwick*, (Lin. Trans. vol. 4 ;) and those of Norfolk and Suffolk (217,) as given by *Messrs. Sheppard and Whitear*, (Lin. Trans. vol. 15.) Thus, I hope, it will be admitted, that the picture I have drawn at the commencement of this paper, of the advantages which this beautiful county offers for the pursuit of Ornithology, has not been exaggerated or too highly coloured; and when we notice the great number of species which the south of Devon presents to us, we may anticipate that the catalogue might be made more extensive, if individuals who have more leisure and opportunity than I have, would devote themselves to the subject, in the interior and northern parts of the county.

In order to form a complete catalogue of British birds, I subjoin a list of those which are considered belonging to the British islands, but which have not hitherto been noticed in Devonshire—these are—

Order 1.

Gen.—FALCONS.

The Lanner—Falco lanarius—*Montagu.*

Spotted Falcon—Falco versicolor—*Pennant.*

Rough-legged Falcon—Falco lagopus—*Lin. Trans. v.* 15.

Swallow-tailed Kite—Falco furcatus—*Lin. Tr. v.* 14.

Gen.—OWLS.

Scops-eared Owl—Scops Asio—*Shaw v.* 13.

Snowy Owl—Strix nyctea—*Lin. Tr. v.* 15.

Order 2.

Gen.—SHRIKES.

Woodchat—Lanius ruficollis—*Lin.*

Gen.—FLYCATCHERS.

Pied Flycatcher—Muscicapa albicollis—*Lin.*

Gen.—SOFTBILLS.

Lesser Whitethroat—Curruca sylviella—*Lin. Trans. v.* 15.

Alpine Warbler or Collared Stare } Accentor alpinus—*Bech. Shaw v.* 13. Motacilla alpinus—*Lin.*

Richard's Lark—Anthus Richardi—*Shaw, v.* 13.

Gen.—SWALLOWS.

Austrian Pratincole—Glareola pratincola—*Lin. Trans. v.* 11.

Gen.—LARKS.

Red Lark—Alauda rubra—*Montagu.*

Gen.—TITMICE.

Crested Titmouse—Parus cristatus—*Shaw*, *v.* 13.

Gen.—BUNTINGS.

Mountain Bunting—Emberiza montana—*Montagu.*

Lapland Bunting—Plectrophanes lapponica—*Shaw*, *v.* 14.

Gen.—SPARROWS, or FINCHES.

Tree or Mountain Sparrow—Passer montanus—*Shaw*, *v.* 14.

Gen.—CROSSBILLS.

White-winged Crossbill—Loxia falcirostra—*Lin. Trans. v.* 7.

Pine Grosbeak { Corythus—*Cuv.*
Strobilophaga enucleator.—*Shaw v.* 14.

Gen.—CROWS.

Nutcracker { Caryocatactes—*Cuv.*
Nucifraga caryocatactes.—*Sh. v.* 14,

Gen.—ROLLERS.

Roller—Coracias garrula—*Lin. Tran. v.* 15.

Order 3.

Gen.—WOODPECKERS.

Hairy Woodpecker—Picus villosus—*Shaw.*

Order 4.

Gen.—PEACOCKS.

Peacock—Pavo cristatus. *Lin.*—domesticated.

Gen.—TURKEYS.

Turkey—Meleagris gallopavo. *Sh. v.* 11.—domesticated.

Gen.—PINTADOS,

Pintado—Numida meleagris. *Sh. v.* 11.—domesticated.

Gen.—PHEASANTS.

Cock—Gallus Bankiva. *Tem.*—domesticated.

Gen.—GROUS.

Wood Grous—Tetrao urogallus—*Lin.*

Red Ptarmigan—Tetrao lagopus—*Lin.*

Ptarmigan—Tetrao albus—*Lin.*

Gen.—PARTRIDGES.

Red-legged Partridge—Perdix rufa—*(Ray.) Lin. Tr. v.* 15.

Order 5.

Gen.—PLOVERS

Kentish Plover—Charadrius cantianus—*Sh. v.* 11.

Gen.—RUNNERS.

Cream-coloured Plover—Cursorius isabellinus—*Sh. v.* 11.

Tribe—*HERONS.*

Cayenne Heron—Nycticorax cayenensis—*Sh. v.* 11.

Egret—Ardea garzetta—*Lin.*

Squacco Heron—Ardea ralloides—*Lin. Tran. v.* 15.

Tribe—*STORKS.*

Black Stork—Ciconia nigra—*Lin. Trans. v.* 12.

Gen.—WOODCOCKS.

Sabines' Snipe—Scolopax Sabini—*Lin. Tr. v.* 14.

Little Woodcock—Scolopax minor—*Pennant. Bri. Zoo.*

Brazilian Curlew—Phœopus guarana—*Montagu.*

Red Phalarope—Lobipes hyperborea—*Sh. v.* 12.

Black Sandpiper—Totanus Lincolniensis—*Pen.*

Red-legged Sandpiper—Totanus Bewickii—*Sh. v.* 12.

Buff-breasted Sandpiper—Tringa rufescens—*Lin. Tr. v.* 16.

Spotted Sandpiper—Totanus macularia—*Sh. v.* 12.

Gen.—RAILS.

Baillion's Gallinule—Rallus Baillionii—*Lin. Tr. v.* 13.

Order 6.

Gen.—DIVERS.

Eared Grebe—Podiceps auritus—*Sh. v.* 13.

Black-throated Diver—Colymbus arcticus—*Sh. v.* 12.

Gen.—PETRELS.

Fulmar Petrel—Procellaria glacialis—*Lin.*

Gen.—GULLS.

Glaucous Gull—Larus glaucus—*Sh. v.* 13.

Pomarine Skua—Catarractes Pomarina—*Lin. Tr. v.* 15.

Masked Gull—Larus capistratus—*Sh. v.* 13.

Gen.—TERNS.

Roseate Tern—Sterna Dougalii—*Mont.*

Gull-billed Tern—Sterna anglica—*Mont.*

Arctic Tern—Sterna arctica—*Sh. v.* 13.

Gen.—PELICANS.

Crested Shag—Phalacrocorax cristatus—*Sh. v.* 13.

Gen.—DUCKS.

Tame Swan,	Cygnus olor	Domesticated.
Chinese Goose, or Swan Goose,	——— Sinensis.	
Canada Goose,	——— Canadensis.	

Red-breasted Goose—Bernicla ruficollis—*Sh. v.* 12.

Black Duck—Oidemia perspicillata—*Sh. v.* 12.

King Duck—Somateria spectabilis—*Sh. v.* 12.

Muscovy Duck—Cairina sylvestris. *(Bewick.)* Domesticated.

Bimaculated Duck—Anas glocitans—*Lin. Tr. v.* 14.

Nyroca Pochard, Castaneous Duck, or Ferruginous Duck—*Mont. Orn. Dic. Sup.* } Fuligula Nyroca—*Sh. v.* 12.

Ferruginous Pochard, or Ferruginous Duck—*Mon. O. D. v.* 1. } Fuligula ferruginea—*Sh. v.* 12.

Plymouth, Mar. 20, 1830.

APPENDIX.

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LIBRARY.

The Society has commenced a Library in furtherance of the general designs of the Institution, but has confined its purchases to works most calculated to assist the members in their researches, and especially in the preparation of lectures. The collection has also been enlarged by the donations of members, and other friends to the Institution, and consists at present of about 700 volumes; among which are presents by

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Among the principal works may be enumerated,

Astle's origin and progress of writing and printing.—4to.
Atlantic Neptune, by Col. des Barres.
Aulus Gellius.—folio.
Acta eruditorum.—4to
Brunet Manuel de Libraire.
Bryant's dictionary of painters.
Cowley's works.—folio.

Cuvier's Animal kingdom, translated by Griffiths and others.
Cuvier's Lecons d' Anatomie comparee.
Casauboni Athenæus.—folio.
Ducange, Glossarium.—folio.
Delphin classics.—(Valpy's edition.)
Dictionnaire, Noveau d'histoire naturelle.
Greenough's geology.
Homeri Carmina.—Heyne.
Hallam's history of the middle ages.
Leslie on heat and moisture.
Lanzi Storia pittorica della Italia.
Lagrange Theorie des Fonctions analytiques.
Laplace Theorie analytique des probabilites.
Londiniana, or Reminiscences of the British capital, by E. W. Brayley.
Lamark, Animaux sans Vertebres.
Muratori Annali d'Italia.
Muller's universal history.
Maskelyne's astronomical observations.
Moh's mineralogy.
Maculloch's classification of rocks.
Northcote's life of Reynolds.
Northcote's prints, from his pictures.—large folio.
Normandy, architectural antiquities of, by Pugin and Le Keux.
Sismondi Historie de Republiques Italiennes.
Spurzheim's physiognomical system.
Stephani Thesausus Linguæ Latinæ.
Scapulæ Lexicon.—(Valpy)—folio.
Syriæ Historia Regum per Foy Vaillant.
Tiraboschi Storia della Letteratura Italiana.
Tower of London, memoirs of, by John Britton and E. W. Brayley.
Warton's history of English poetry.
Wightwick's views of Rome.

Also the following periodicals.

Transactions of the Royal Society of London—of Edinburgh—of the Cambridge Philosophical Society—of the Royal Society of Literature—of the Asiatic Society of Calcutta. Repertory of Arts. Annals of Philosophy. Edinburgh Journal of Science. Philosophical Magazine. Mechanic's Magazine. Journals des Savans. Le Globe. Annales de Chimie. Oxford and Cambridge University Calendars, &c.

MUSEUM.

The museum is of recent formation; the building which contains it was commenced in 1828, and finished in 1829. As yet the extent of the collection is by no means considerable, although it contains some rare contributions, not only from many noble and private individuals, but also from His Majesty's Government. There is every reason however to hope, from the numerous additions constantly receiving, in every department, that a valuable collection will ultimately be procured.—Several cases for mammalia, birds, fishes, and reptiles; and suites of drawers for insects, minerals, fossils, and organic remains, &c. have been fitted up: in the former is already collected, a considerable series of specimens (some preserved dry and others in spirits,) from the Arctic regions, the Brazils, Peru, Western Africa, the Cape, &c. for which we are chiefly indebted to His Serene Highness Prince Maximilian of Wied; Captains Franklin, Parry, Mends, Filmore, and Delafons, of the Royal Navy, the Rev. Wm. Hennah, Mr. I. Loudon, Mr. G. Coryndon, &c. A British series has also recently been commenced; contributions to which are to be acknowledged from Mr. R. W. Coryndon, Dr. E. Moore, Mr. Gabriel, &c. In the drawers are contained some beautiful insects, foreign and domestic, presented by Mr. T. F. Jessep, Dr. Leach, Miss Nelson, &c. and arranged by Dr. Leach. An extensive series of minerals, volcanic productions and petrifactions, presented by Prince Maximilian of Wied, Mrs. Dr. Lockyer, Mr. R. W. Fox, Capt. Filmore, Mr. A. Frazer, and arranged by Mr. J. Prideaux. The geological department comprises, amongst many others, specimens illustrative of the geology of Jersey, presented by Lieut. Nelson, R. E. and a very complete series from the neighbourhood of Plymouth, by Mr. John Prideaux. Organic remains from the caverns in the vicinity of Torquay, Oreston, and the limestone quarries near Plymouth, have been contributed by the Rev. R. Hennah, Rev. Mr. M'cEnery, Mr. J. Whidbey, Mr. R. Rattenbury, Mr. Foulston, &c. In the cabinets, are contained, a very complete series of crabs, presented by Charles Prideaux, esq. and Dr. Leach. A collection of coins, among which are many rare and valuable ones from Mr. W. Prideaux, Mr. W. Burt, &c.; and a series of specimens of wood, foreign and domestic, presented by Col. H. Smith: also some fine specimens of corals. An interesting series of Peruvian pottery, dug out of the graves of the Aborigines; together with some Egyptian, Gallic, Burmese, African, and South Sea idols, has been received from Capt. Mends, Rev. Wm. Hennah, Mr. I. Loudon, Mr. David Ross. On the walls are suspended, numerous specimens of natural history, and artificial curiosities; comprising ancient utensils, implements of war, musical instruments, &c. from Asia, Africa, North and South America, the South Sea Islands, &c. contributed by Sir Digory Forrest, Captain Filmore, Capt. G. Woollcombe, Col. George Arthur, Governor of Van Dieman's Land, &c. In the space of the museum, not yet occupied by cases, are deposited, a manuscript map of the world by Ensign C. Smith, 28th Regt.; a valuable geological map of England and Wales, and a map of the settlement in New South Wales, presented by H. Baynham, esq. A specific catalogue of the contents of the museum, with the name of the donor attached to each of the specimens, is in progress for publication.

The Institution also possesses some valuable casts, of which the following are the principal.

Presented by his late Majesty King George IV.

Nine of the fifteen Metopes from the Parthenon, representing the combat between the Centaurs and the Lapithæ.

Part of the frieze of the Parthenon, representing the Panathenaic procession.

The river god Illissus.

A Cupid.

The Apollo Belvidere; presented by Admiral Sir Byam Martin, K. C. B.

Head of one of the Horses belonging to the Chariot of Night; presented by Mr. B. R. Haydon.

The Theseus from the Parthenon.—The Venus de Medici; presented by the late Sir William Congreve, Bart.

The Antinous of the Capitol; presented by the Right Honourable the Earl of Morley.

Bust of Minerva; presented by Rev. R. Lampen.

Bust of Achilles; presented by Mr. E. Calvert.

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